RADIOLOGY

A MONTHLY JOURNAL DEVOTED TO CLINICAL RADIOLOGY AND ALLIED SCIENCES

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A MONTHLY PUBLICATION DEVOTED TO CLINICAL RADIOLOGY AND ALLIED SCIENCES

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RADIOLOGY

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Vol. 55 DECEMBER 1950 No. 6

A Roentgen Study of Skeletal and Intrathoracic Metastases from Salivary Gland Cancer[1]

DANIEL WILNER, M.D.[2]

DURING THE PAST few years we have encountered an increasing number of cancer metastases of salivary gland origin in roentgen examinations of the chest and bones. Since there seems to be no study of a large series specifically devoted to the roentgen appearance of these metastases, it appears to be of value to review in a brief manner the material available at this hospital. The present report is based on 49 histologically proved cancers of the major salivary glands showing metastases to the chest or to the skeleton as revealed roentgenographically. These cases were selected from a total of 716 tumors of salivary gland origin, in 229 of which one or more chest films were obtained, while in 149 there was adequate film coverage of the bones.

Livingston (4) described a "mixed" tumor of the parotid gland which invaded the mandible and metastasized to the bones of the anterior chest wall. Lampe and Zatzkin (3) reported 25 cases of "pseudo-adenomatous basal-cell carcinoma," only 4 of which arose in the major salivary glands. Pulmonary metastases were discovered by roentgenographic examination in 5 patients, but in only one of these was the origin from the parotid gland itself. The pulmonary lesions were large, sharply circumscribed nodular masses disseminated throughout both lungs.

Quattlebaum, Dockerty, and Mayo (8) studied 20 cases of "cylindromatous type adenocarcinoma" of the parotid gland. Eight patients succumbed within five years to the effects of metastasis, 5 with evidence of pulmonary spread. Smith and Stenstrom (9), in a review of 93 parotid tumors, found pulmonary metastasis to be present in 2 cases and osteoblastic metastasis to the pelvis and spine in an additional 2. Stein and Geschickter (10) discovered metastasis to the lung once and to the mediastinum twice. They stated that distant metastases are extremely rare. Ahlbom (1) reported that in 82 cases of malignant tumor of the salivary glands, metastasis occurred to the lungs in 7 and to the bones in an equal number.

Taylor and Garcelon (11), in their series of 73 carcinomas of the parotid and submaxillary glands, discovered pulmonary metastasis in 4 instances. Perrin (7) described a "mixed" tumor of the parotid gland with multiple distant metastases. Fort (2) presented 4 cases of carcinoma of the parotid gland with bone metastasis. Three showed destructive lesions, while one was productive in nature. Fort also

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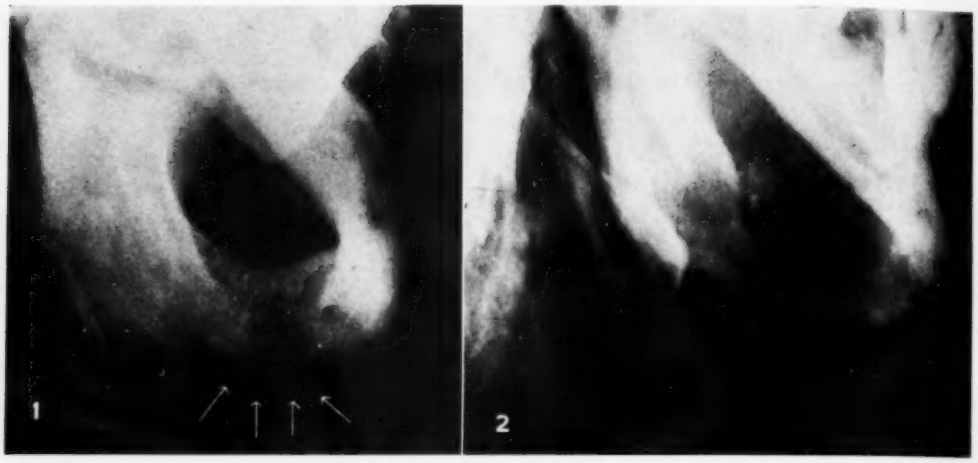


Fig. 1. Erosive type of bone metastasis, showing a wavy or scalloped area of bone destruction along the under surface of the body of the mandible.

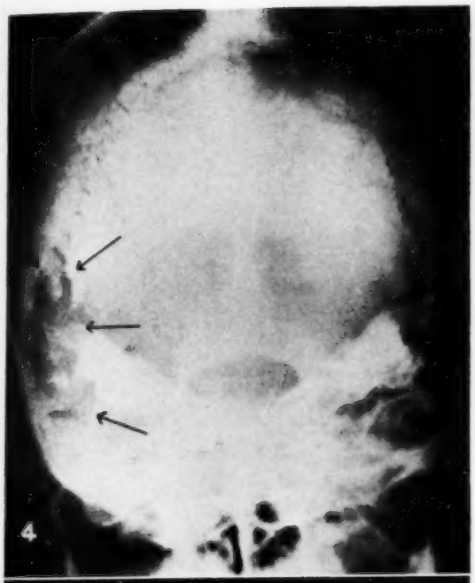
Fig. 2. Patchy type of bone metastasis showing spotty, irregular areas of bone destruction in the ramus and adjacent body of the mandible.

Fig. 3. Lytic type of cancer metastasis. A ragged, irregular area of bone destruction involves the greater portion of the ramus of the mandible and appears to have invaded the body of the mandible as well. Some ill-defined spicules of bone in the superior portion of the ramus remain behind.

described a carcinoma of the submaxillary gland which had invaded the mandible. Turner and Jaffe (12), in a group of 7 autopsied cases, found evidence of bone metastasis in 2 instances and lung metastasis in 4. Roentgenographic studies showed that the bone metastases were all of the lytic type. The pulmonary metastases were predominantly large nodules. MacFee (5) stated that metastasis to the lungs is more common than is generally recognized. In a series of 27 cases, 8 showed convincing evidence of pulmonary metastasis. The bones were involved in 2 cases. Mulligan (6) described 21 salivary gland tumors which yielded metastases. In his series, 18 metastasized to the lungs, 12 to the pleura, and 8 to the bones. No mention was made of the total number of cases investigated nor of the roentgen appearance of the metastases.

In the 49 tumors constituting the basis of this study the pathological diagnoses as recorded on the hospital charts were as follows:

	No. Cases
Parotid	
Carcinoma	9
Epidermoid carcinoma	2
Mucoepidermoid carcinoma	2
Adenocarcinoma	9
Adenoid cystic carcinoma	1
Alveolar carcinoma	1
Malignant mixed tumor	8
Submaxillary	
Carcinoma	1
Epidermoid carcinoma	4
Adenocarcinoma	5
Adenoid cystic carcinoma	5
Malignant mixed tumor	1
Sublingual	
Adenocarcinoma	1



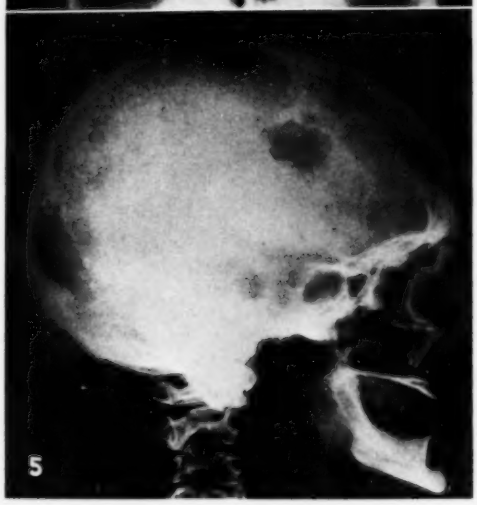


Fig. 4. Lytic type of cancer metastasis involving the base of the skull on the left side. The lesion consists of a sharply circumscribed area of bone destruction which has invaded the mastoid air cells and the petrous portion of the temporal bone and has extended into the adjacent temporo-occipital region.

Fig. 5. Lytic type of cancer metastasis involving the right frontoparietal region of the skull, characterized by the presence of a sharply outlined lobulated bony defect.

Fig. 6. Lytic type of bone metastasis involving the body of the fourth cervical vertebra.

SKELETAL METASTASES

Thirty-three cases showed metastasis to bone. In 21 of these the metastasis was of solitary form and in 12 there were metastases to two or more bones. The location in the skeleton was as follows: mandible 20, spine 8, pelvis 6, skull 5, ribs 3, femur 3, scapula 1, humerus 1.

The metastases in bone were roughly classifiable into three general types on the basis of their roentgen appearance. The "patchy" type showed fine, spotty, irregular, moth-eaten areas of bone destruction (Fig. 8). The "lytic" type was characterized by the presence of large, purely destructive defects (Figs. 4, 5, 7). The "erosive" type, in which the most significant changes occurred in the cortex, presented margins with a wavy or scalloped configuration (Fig. 1). Generally speaking, the lesions were about equally divided between the "patchy" and the "lytic" types, with the "erosive" being observed only in the mandible. Some metastases of the lytic type were sharply demarcated (Figs. 5 and 7), while others in this category had ill-defined borders, gradually fading off into the normal bone architecture (Fig. 8). Occasionally fine septa or faint trabeculae were noted in the mid-portion of the bone destruction in the lytic form. Usually the metastases were confined to the medullary part of the bone, although several of

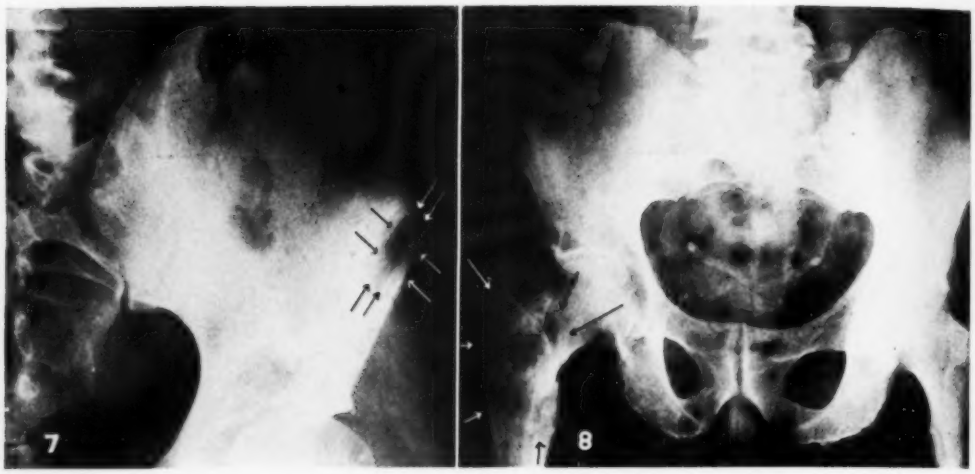


Fig. 7. Lytic metastasis in the external aspect of left innominate, characterized by an elongated bony defect with surrounding sclerosis of bone.
Fig. 8. Patchy cancer metastasis in the neck and proximal shaft of the right femur.

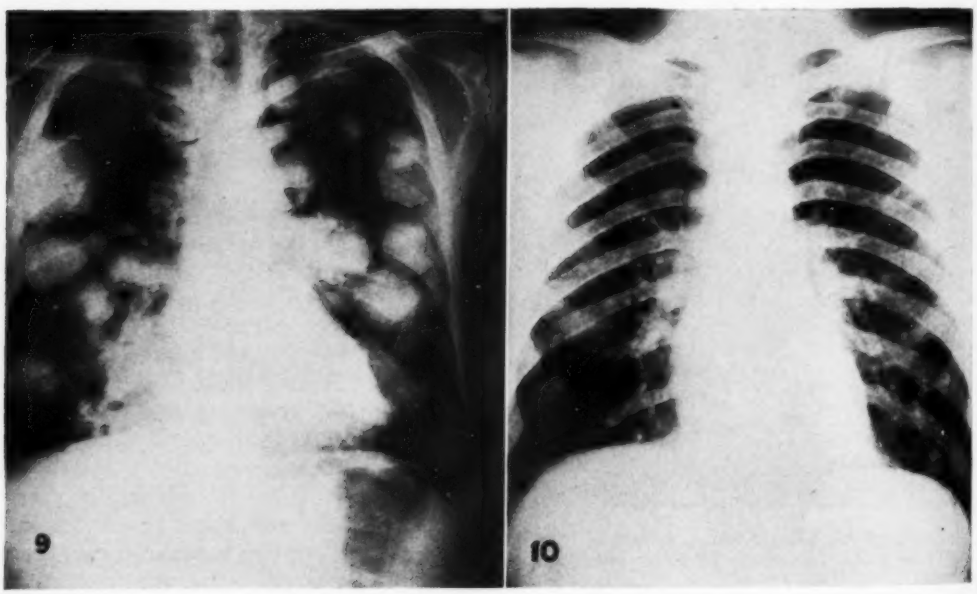


Fig. 9. "Nodular" type of pulmonary metastasis.
Fig. 10. Miliary type of metastasis consisting of small, discrete, nodular densities scattered throughout both lungs.

the lytic type showed complete destruction of the cortex as well. In a single case there was a combination of both osteolytic and osteoblastic change, evidenced by an oval area of radiolucency in the medullary portion of the shaft of the humerus, with irregular periosteal bone formation of the laminated variety. A soft-tissue mass was observed in only 3 cases.

In 7 of the 8 cases where there was metastasis to the spine, a pathological fracture was present (Fig. 6). When the mandible was invaded, the appearance of the bone involvement varied as follows:

Four tumors showed an erosive type of process (Fig. 1), 5 presented patchy areas of bone destruction (Fig. 2), and in 11 cases there were large osteolytic defects in either the ramus or body, frequently causing extensive destruction of the mandible (Fig. 3). In 4 of the 5 cases showing metastasis to the skull the base was the site of involvement. The basilar metastases were osteolytic, producing circumscribed defects in the floor of the middle and posterior cranial fossae. Occasionally the mastoid, petrous pyramid, part of the wing of the sphenoid and occipital area were involved in the destructive process (Fig. 4).

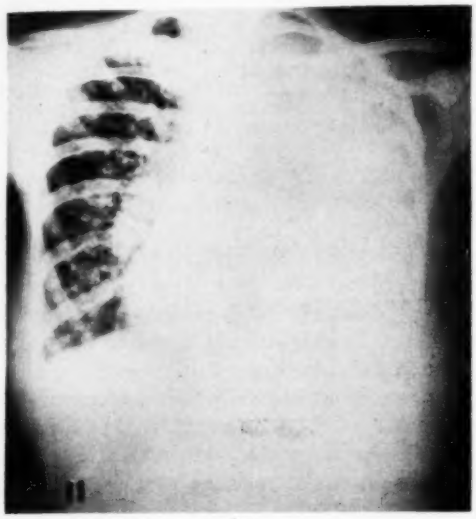


Fig. 11. Hydrothorax on the left side. The right lung shows widespread nodular cancer metastases.

INTRATHORACIC METASTASES

The intrathoracic lesions have been divided into those of the lung, the pleura, and the mediastinum. Among the 28 cases showing deposits within the chest, mediastinal involvement occurred once. A pleural reaction, indicating pleural metastases, was observed in 7 instances. There were 23 cases of pulmonary metastasis. Whenever a pleural effusion was encountered, it always accompanied lung disease (Fig. 11).

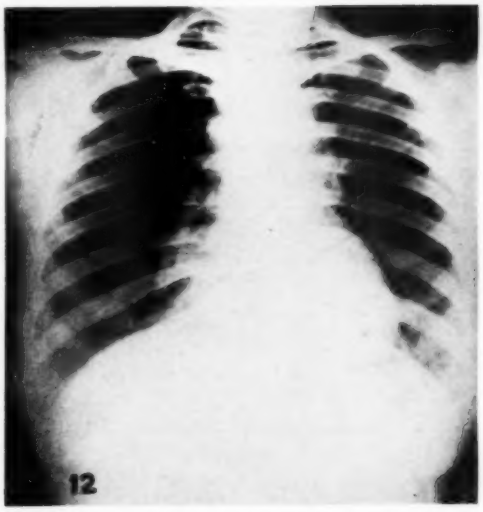


Fig. 12. Metastasis to the mediastinal lymph nodes.

The parenchymal lesions were of two types, the "nodular" and the "miliary." The "nodular" was characterized by one or more fairly large, sharply outlined spheres of water density. Occasionally a solitary nodule or two or three discrete nodules were observed but, as a rule, multiple nodules were diffusely scattered in the lungs (Fig. 9). These deposits were homogeneous, and no instance of calcification or excavation was discovered. Eighteen of the 23 cases fell into this group.

The "miliary" type consisted of innumerable small, discrete, circular densities scattered diffusely throughout each lung. Five cases were so classified (Fig. 10). There was one instance where both large nodular masses and the fine diffuse miliary deposits occurred together. In no case was a lymphatic form of metastasis seen.

CONCLUSIONS

1. Skeletal and intrathoracic metastases from 49 cases of cancer of the major salivary glands have been studied roentgenographically.

2. Salivary gland cancer metastases to bone produced three types of lesions, (*a*) "erosive," (*b*) "patchy," and (*c*) "lytic."

3. The metastases to the lungs were of

two forms, (*a*) "nodular," and (*b*) "miliary." The majority were nodular.

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REFERENCES

1. AHLBOM, H. E.: Mucous- and Salivary-Gland Tumours. Acta radiol., Supplement 23, 1935.
2. FORT, W. A.: Cancer Metastatic to Bone. Radiology **24:** 96–98, January 1935.
3. LAMPE, I., AND ZATZKIN, H.: Pulmonary Metastases of Pseudo-Adenomatous Basal-Cell Carcinoma (Mucous and Salivary Gland Tumor). Radiology **53:** 379–385, September 1949.
4. LIVINGSTON, S. K.: Teratoma (Mixed Tumor) of the Right Parotid Gland with Metastasis to Sternum and Second Rib Left. Case Report. Am. J. Roentgenol. **44:** 887–888, December 1940.
5. MACFEE, W. F.: Malignant Tumors of the Salivary Glands. Ann. Surg. **109:** 534–550, April 1939.
6. MULLIGAN, R. M.: Metastasis of Mixed Tumors of the Salivary Glands. Arch. Path. **35:** 357–365, March 1943.
7. PERRIN, T. L.: Mixed Tumor of the Parotid with Metastases. Arch. Path. **33:** 930–934, June 1942.
8. QUATTLEBAUM, F. W., DOCKERTY, M. B., AND MAYO, C. W.: Adenocarcinoma, Cylindroma Type of the Parotid Gland. Clinical and Pathologic Study of 21 Cases. Surg., Gynec. & Obst. **82:** 342–347, March 1946.
9. SMITH, M. J., AND STENSTROM, K. W.: Parotid Tumors: A Review of Ninety-Three Cases. Radiology **52:** 655–661, May 1949.
10. STEIN, I., AND GESCHICKTER, C. F.: Tumors of the Parotid Gland. Arch. Surg. **28:** 492–526, March 1934.
11. TAYLOR, G. W., AND GARCELON, G. G.: Tumors of Salivary-Gland Origin. New England J. Med. **238:** 766–768, May 27, 1948.
12. TURNER, J. W., AND JAFFE, H. L.: Metastatic Neoplasms: A Clinical and Roentgenological Study of Involvement of Skeleton and Lungs. Am. J. Roentgenol. **43:** 479–492, April 1940.

SUMARIO

Estudio Roentgenológico de la Metástasis Esqueléticas e Intratorácicas del Cáncer de las Glándulas Salivales

Las metástasis óseas e intratorácicas de 49 casos de cáncer de las principales glándulas salivales fueron estudiadas roentgenográficamente.

Las metástasis óseas del cáncer de las glándulas salivales produjeron tres clases de lesiones: (*a*) "erosiva," (*b*) "salteada," y (*c*) "lítica." Los huesos afectados fueron: la mandíbula en 20 casos, el raquis en 8, los pelvianos en 6, el cráneo en 5, las costillas en 3, el fémur en 3, el omoplato y el húmero en uno cada uno.

Las metástasis pulmonares tomaron dos formas: (*a*) nodulares y (*b*) miliares, siendo la mayoría nodulares. Hubo un caso de invasión mediastínica, y en 7 casos se observó reacción pleural, indicativa de metástasis pleurales.

The Fallacy in the Diagnosis of Microcolon in the Newborn[1]

C. MARSHALL LEE, JR., M.D., and BRUCE G. MACMILLAN, M.D.
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WITH THE increasing recognition of such congenital anomalies as atresia of the bowel and meconium ileus, the diagnosis of microcolon is being made with less frequency. That it is made at all as a diagnostic entity is unfortunate because of the erroneous clinical impression that the term conveys. Because of the confusion in clinical interpretation, there has been a fatal outcome in nearly all reported cases diagnosed as microcolon. Many of these infants could be saved if the general concept of the condition were clarified.

The first descriptions of microcolon as a clinical entity have been credited to Calder (6) and to Osiander (29). For many years the condition has been generally regarded as a primary congenital anomaly and persistence of this misconception has resulted in many needless deaths. A comprehensive and thoughtful analysis of the subject was published by Greig in 1925 (16). In the course of the discussion he said: "Congenital microcolon may be more frequent than the paucity of published references to it would lead one to expect. Coeliotomy in newborn infants is infrequent and a comparatively recent practice, and postmortem examination of infants who die within the first few days of birth is rare, as precision in diagnosis is not legally required. In congenital microcolon the viscus is a colon in miniature. Every detail is represented, the lumen is present, and the coats bear normal proportion to each other, but everything is unduly small. The mucous lining has secreted its succus entericus, *but the bowel contains no meconium*" [italics ours]. At the other extreme is ReBell's statement (33) that "the term microcolon refers to the congenital narrowing of any portion of the intestinal tract with resultant stenosis." Dorland (10) defines microcolon simply as "an abnormally small colon." Stedman (37) does not define it at all. Most standard textbooks of surgery make no mention of it. Brenner, in his textbook of pediatric surgery (3), dismisses the subject with four lines. Ladd and Gross (24) make no mention of it in their monograph. Rankin (32) devotes less than a page to it, mainly to emphasize its extreme rarity. That microcolon is officially recognized as a diagnostic entity is indicated by its listing (microcolon, congenital—660-016) in the most recent edition of the *Standard Nomenclature of Disease* of the American Medical Association.

It is apparent that the usually accepted concept is that microcolon is a primary congenital anomaly not amenable to surgical correction. The incidence is difficult to ascertain, because of the lack of any general agreement over terminology and because most figures are based on incidence among large series of necropsies without regard to whether infants are proportionately represented among the cases studied. Undoubtedly many cases in which the diagnosis is made either surgically or roentgenologically are never reported. We believe that the incidence of the condition diagnosed as microcolon is considerably greater than most statistical analyses would suggest. It is reasonable to suppose that the prognosis among unreported cases is as bad as it is among those which find their way into the literature. The incidence and consequent avoidable mortality are therefore probably much greater than is suggested by various statistics.

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The result of this widespread misinterpretation of the pathological anatomy of microcolon is illustrated by the following two cases.

CASE 1: C. J. L., a white female infant weighing 7 pounds and 12 ounces, whose delivery was uncomplicated, was admitted to Children's Hospital Aug. 7, 1941, two days after birth. The child had begun to vomit with rapidly increasing severity a few hours after birth, and the abdomen was severely distended.

The roentgen report was in part as follows: ". . . plain films show tremendously dilated loops of bowel which cannot be identified as to small or large because of their smooth walls. The stomach is also distended with air. An attempted barium enema shows a thin column of barium outlining the distal third of the colon, which has a very narrow lumen. None of the injecta passes beyond the middle third of the transverse. Twelve hours later there is a thread-like shadow in the distal colon which is a residue of the enema. Barium given through a gastric tube does not leave the stomach even after three hours. Practically the same degree of distention is present at all times."

Under a diagnosis of intestinal obstruction and microcolon, an exploratory laparotomy was done. Atresia of the terminal ileum was found, but because of the microcolon, the report continues, "the case was obviously hopeless, but we were able to free a few adhesions. It was decided to close, and this was done in the usual way, in layers." No attempt was made to relieve the obstruction, since the microcolon was supposed to make any corrective procedure hopeless. The infant died twenty-four hours after operation. Consent for autopsy was not obtained.

CASE 2: C. W., a white male weighing 7 pounds and 6 ounces, was delivered normally in another hospital. Shortly after birth persistent vomiting of meconium-like material developed and distention occurred. It was noted that the child "had one bowel movement, but that is questionable."

Roentgenograms suggested obstruction, and the infant was admitted to the Children's Hospital on Oct. 29, 1946, when he was three days old. Continuous gastric suction and parenteral supportive therapy were instituted, and on the day following admission, an exploratory laparotomy was done. The following findings are quoted verbatim from the operative note. "Approximately 4.0 cm. from the pelvic floor, the constriction of the large bowel began and the remainder of the sigmoid, descending, transverse, and ascending colon were all approximately the size of a lead pencil. These structures were collapsed and had been previously shown by barium enema to have a lumen. . . . In the region of the ileocecal junction, no bowel could be identified, but the terminal ileum and the rest of the small bowel, which was moderately dilated, ended in a blind pouch which connected with the cecum by a small strand of fibrous connective tissue." A diagnosis, both preoperative and postoperative, of microcolon was made and a side-to-side ileosigmoidostomy was done, with anastomosis of the blind ileum to the lower sigmoid and upper rectal ampulla, under the impression that the microcolon could not be made to function. The note concludes: "This left the microcolon as a blind pouch draining into the sigmoid, and it was thought that the child's condition at the present time did not warrant further surgery." Although conscientious supportive therapy was administered, distention became extreme and death ensued seventeen hours after operation. Permission for autopsy was refused.

Situations such as these are by no means unique. Many cases have been reported in the literature, all with fatal terminations, in which the presence of microcolon was the deterrent to effective corrective surgery. Rankin refers to reports by Fyfe in 1903 and by Porter and Weeks in 1915. Critical examination of these reports shows that Fyfe's case (15) was one of stenosis at the splenic flexure, with a lumen so narrow as to approximate a true atresia. The colon distal to this obstruction was a microcolon. Porter and Weeks' case (30) appears to have been a typical case of meconium ileus, and again the colon was small and empty distal to the complete obstruction caused by this condition. The two cases reported by Stephenson (36) include insufficient detail for analysis, but one appears to have been secondary to meconium ileus and the other to atresia of the transverse colon.[2] Ewing and Cooke's two cases (11) were also secondary to meconium ileus. In each of the two cases reported by ReBell the small colon was distal to an obstruction from meconium ileus. The same is true of Kleiner's patient (20). A case reported by Sims and Meyers (35) appears to have been secondary to atresia of the ascending colon. Of Zimmer's two cases (42), one was secondary to meconium ileus and the other to atresia of the ileum.

In a few instances the original papers

[2] This is by no means a reflection on these writers. While it is true that meconium ileus was first described by Landsteiner in 1905, there was very little general recognition of it until the reports of Anderson and of Farber appeared between 1940 and 1945.

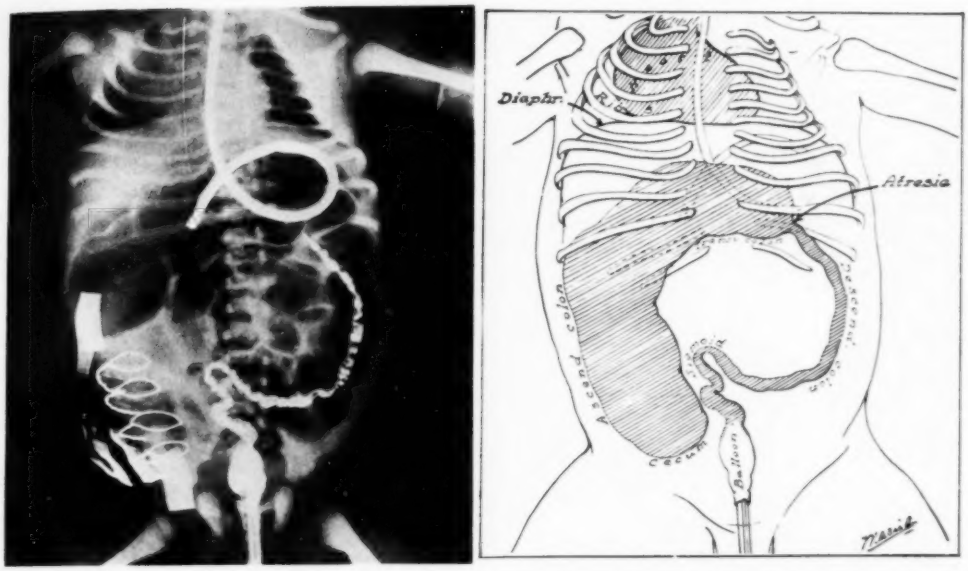

Fig. 1. Case 3: Barium contrast roentgenogram. The wire sutures in the right lower quadrant are in the wound from the initial laparotomy at which the perforation of the cecum was closed. The pneumoperitoneum incident to the perforation and laparotomy is plainly seen, as is the marked elevation of the diaphragm from abdominal distention. These features are not essential to the diagnosis of atresia and the film and tracing are shown primarily for the excellent demonstration of the tiny colon, which is considered diagnostic of complete congenital obstruction. The word "microcolon" should have no part in the diagnosis except as a descriptive term.

reporting cases of microcolon, especially those in the earlier foreign literature, have not been available to us. However, all available sources have been consulted and some of these, notably Greig's, refer to other reports in sufficient detail to permit limited critical analysis of cases in which the original record could not be consulted. No authentic case of primary microcolon has been found. On the basis of information furnished, all of the cases described as microcolon have occurred in instances in which the bowel has at some point been completely obstructed *in utero*. The colon distal to the obstruction has never contained meconium or served its purpose as an alimentary canal. In consequence, it has remained collapsed and non-functional.

This situation is illustrated by the following case:

CASE 3: V. M., a white male weighing 8 pounds and 4 ounces, was referred to the Children's Hospital on April 27, 1949, when sixty hours old. He had been delivered by low forceps, from a vertex presentation, in another hospital. About twelve hours after birth, he began to vomit with increasing frequency and severity, and distention rapidly developed. Clinical and roentgen examination indicated a complete intestinal obstruction, with rupture of a hollow viscus. Because of the suspected presence of a perforation, contrast roentgenograms were not done initially.

After appropriate parenteral fluid therapy, exploratory laparotomy was done through a small right rectus incision. A large perforation of the cecum was found, with generalized meconium peritonitis, and because of this, general exploration of the abdomen was not undertaken. The perforation of the cecum was repaired, and the small exploratory incision was closed with silver wire.

The following day a barium enema was administered, showing a very narrow undeveloped colon with obstruction just proximal to the splenic flexure (Fig. 1). Fourteen hours after the first operation a second laparotomy was performed through a transverse upper abdominal incision. An atresia of the transverse colon, proximal to the splenic flexure, was found and resected with side-to-side anastomosis. The abdominal wound was closed with silver wire. The infant made an excellent recovery and was discharged on the twenty-seventh postoperative day. A barium enema study on Sept. 29, 1949 (Fig. 2), five months after resection, showed that the distal colon had increased in size until it approached a normal

Fig. 2. Case 3: Barium enema five months after resection of the atresia. The site of anastomosis is not seen, but its location is indicated in the tracing. Some degree of megacolon persists, but the infant's clinical condition is good, and he has daily bowel movements without assistance. In spite of the dilatation of the proximal colon, excellent peristaltic contractions can be seen. The "microcolon" previously shown is rapidly approaching normal proportions for an infant of this age.

configuration for an infant of that age. Although a considerable degree of obstructive megacolon is still present, excellent peristaltic contractions are seen and the child is doing well clinically. At eleven months of age he has no apparent discomfort, his appetite and weight gain are normal, and he has a spontaneous bowel movement every day.

Since this case represents the first recorded recovery from perforation of the large bowel in a newborn infant, it is reported in detail elsewhere (25). Such a detailed report is not pertinent to the present discussion, but the brief summary presented illustrates the type of case in which a diagnosis of microcolon might prevent a successful outcome.

There appears to be no embryological evidence that microcolon exists as a primary anomaly. It is not described in standard textbooks of embryology. It is generally recognized that between the fifth and tenth weeks of embryonic life the bowel, which prior to this has had a lumen, goes through a solid stage (22, 23, 24), during which the lumen is obliterated by the coalescence of ingrowing folds of mucosal epithelium. The intervening vacuoles then merge again so that the lumen becomes patent at about the tenth to twelfth week of fetal life. If this process becomes arrested at any given point, an atresia or a stenosis is the result. The atresia may be localized to a single point or to multiple points as a diaphragm-like obstruction, or it may involve a segment of the bowel which remains cord-like and without a lumen. The bowel distal to such an obstructing atresia remains empty and collapsed, but in the great majority of cases this tiny undeveloped bowel is intrinsically sound and will function well if normal fecal contents are made available to it. Many writers (1, 13, 24, 25, 31, 38) have commented on this fact, and when the relationship of the small colon to the underlying atresia is recognized, surgical intervention has frequently been successful.

It is true that in extremely rare instances the entire colon may remain atretic, consisting of a solid cord without a lumen.

One such case was reported in 1877 by Coley (7) and another in 1935 by Klinefelter (21). Cases of this kind represent complete obliteration of the large bowel and properly fall in the category of total atresia.

The point that does not seem to be generally appreciated is that meconium ileus may produce just as complete an obstruction as does atresia. It must be remembered that meconium ileus is not a primary condition but is the result of pancreatic insufficiency. As Farber (12) and others have shown, the disease affects the liver, the salivary glands, and the tracheal and bronchial glands, as well as the pancreas. When the pancreas is predominantly or primarily involved, its secretion of trypsin and other digestive enzymes is seriously impaired. This deficiency, perhaps coupled with impaired liver function, results in improper digestion of meconium in the upper bowel. Instead of being soft and semi-liquid, the meconium becomes thick and putty-like as it moves down the intestine and may produce an impaction in the ileum with complete obstruction.

Fibrocystic disease of the pancreas, the cause of which is unknown, occurs with varying severity. It may affect the unborn fetus or may not become clinically apparent until after the neonatal period, when it is usually manifested as the so-called celiac syndrome. Hiatt and Wilson (17) reviewed the published cases of meconium ileus up to 1947 and added 8 of their own. They pointed out that cystic fibrosis of the pancreas, in its milder form, may produce slight transitory obstruction or none at all, but that "...with meconium ileus of the most severe form...it was inconceivable that the obstruction could be relieved by any... conservative measures." They commented that: "The large intestine in each case in the series was found to be empty, small and hypoplastic." The same situation is found in other reported cases of meconium ileus (4, 5, 9) in which the large bowel is described.

If Greig's definition of microcolon is accepted, it seems reasonable to assume that the tiny empty colon is secondary to complete obstruction, usually in the form of congenital atresia or of meconium ileus. All of the cases cited fall into one or the other of these categories.

To prevent further avoidable confusion it should be emphasized that the relatively narrow terminal segment seen in true Hirschsprung's disease is totally unrelated to microcolon in the usually accepted interpretation of the term. Here the bowel is normal in size or only slightly smaller than normal. It contains meconium, and the obstruction is incomplete. It is not incompatible with life and is manifested clinically by obstipation, which can be relieved, temporarily at least, by laxatives and enemata. Such a terminal segment is grossly normal to digital and proctoscopic examination. It is in a state of chronic non-relaxation (achalasia) resulting from deficiency of the parasympathetic ganglia of Auerbach's and Meissner's plexuses, and the resulting functional and incomplete obstruction, if uncorrected, leads to the rapid development of megacolon above the achalasic segment (2, 26, 34, 39, 40, 41). Actually this condition has no place in the present discussion, but is mentioned only to exclude it from consideration of microcolon as Greig and others have defined it. ReBell's all-inclusive definition is obviously untenable, since it would include all constrictions of the small or large bowel, atresia, stenosis, achalasia, and congenital extrinsic bands due to faulty or premature peritoneal fixation. Such a definition serves only to compound the confusion which misinterpretation of the term has produced.

The accumulated evidence leads to the conclusion that primary microcolon does not exist and that the use of the term as designating a diagnostic entity should be abandoned. Re-evaluation of reported cases indicates that what has been termed microcolon is always secondary to an underlying primary anomaly. The word should be purely descriptive, if it is used

at all, and should be clearly understood to mean that an underlying and usually correctable anomaly is present. The demonstration of a tiny pencil-sized colon in a newborn infant, whether by barium enema or at operation, indicates a complete obstruction which, the patient's condition permitting, can be cured by appropriate surgery. To call it congenital microcolon does much to deny the infant his chance of recovery.

Although originality for this conception is not claimed, it has not been found categorically stated in the literature. It is suggested in Greig's article and has also been implied in papers by Hunt (18) and by Itoiz and Otero (19), both of which are quoted by Feldman (14). But unless the fallacy in the use of the term is clearly and emphatically pointed out, the confusion it has caused will persist, and the dismal round of autopsy reports of cases of microcolon will continue. As long as meconium ileus was regarded as uniformly fatal, it made little difference whether death was ascribed to that cause or to congenital microcolon. But since Hiatt and Wilson's report of 4 cases of successful operation in meconium ileus, and with the many reports of successful surgery for congenital atresia of the bowel, it becomes essential that the secondary nature of microcolon be universally recognized. It is obvious that operation will not be successful in every case, the inherent risks being what they are in these acutely ill infants. Moreover, in those cases in which the obstruction is due to meconium ileus, successful correction of the obstruction does not cure the underlying pancreatic and collateral disorders. Many of these patients may succumb to pulmonary complications or to nutritional disturbances, but some may go on to reasonably normal and productive lives. The fact remains that no case should be abandoned as hopeless simply because a "microcolon" is found.

CONCLUSIONS

1. The term microcolon is merely symptomatically descriptive, and the evidence indicates that no such primary anomaly exists. The demonstration, in a newborn infant, of a small undeveloped colon, by barium enema or at operation, should be regarded as diagnostic of complete intestinal obstruction, and the cause of the obstruction should be sought and corrected.

2. The persistence of the concept that microcolon is a primary congenital anomaly not amenable to surgical correction continues to deprive many newborn infants of their chance of survival.

3. The use of the term microcolon to designate a clinical entity should be abandoned.

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REFERENCES

1. ALLEN, A. W., AND WELCH, C. E.: Surgery of the Small Intestine. In Operative Surgery, edited by F. W. Bancroft. New York, D. Appleton-Century, 1941.

2. BODIAN, M., STEPHENS, F. D., AND WARD, B. C. H.: Hirschsprung's Disease and Idiopathic Megacolon. Lancet **1:** 6–11, Jan. 1, 1949.

3. BRENNER, E. C.: Pediatric Surgery. Philadelphia, Lea & Febiger Co., 1938.

4. BRONAUGH, W., AND LATTIMER, R. D.: Intestinal Obstruction from Inspissated Meconium. Am. J. Dis. Child. **60:** 1371–1374, December 1940.

5. BURGER, P.: Cas rare d'iléus du nouveau-né par épaississement du meconium. Gynéc. et obst. **37:** 176–177, March 1938.

6. CALDER, J.: Medical Essays **1:** 203, 1733. Quoted by Hunt (18).

7. COLEY, I.: Trans. Path. Soc., London **29:** 115, 1877. Quoted by Sims and Meyers (35).

8. COOKE, W. E., AND ELLIS, G. R.: Congenital Microcolon. Lancet **1:** 813, April 3, 1937.

9. DODD, K.: Intestinal Obstruction Due to Meconium Ileus in a Newborn Infant. Case Report. J. Pediat. **9:** 486–491, October 1936.

10. DORLAND, W. A. N., AND MILLER, E. C. L.: The American Illustrated Medical Dictionary. Philadelphia, W. B. Saunders Co., 21st ed., 1947.

11. EWING, J. B., AND COOKE, W. E.: Two Cases of Congenital Microcolon. Brit. J. Surg. **25:** 506–510, January 1938.

12. FARBER, S.: Relation of Pancreatic Achylia to Meconium Ileus. J. Pediat. **24:** 387–392, April 1944.

13. FARR, C. E.: In discussion of a paper by E. J. Donovan: Congenital Atresia of Duodenum in Newborn; Duodenojejunostomy. Ann. Surg. **103:** 455–457, March 1936.

14. FELDMAN, M.: Clinical Roentgenology of the Digestive Tract. Baltimore, Williams & Wilkins Co., 2d ed., 1945.

15. FYFE, W. W.: Congenital Obliteration of the Colon. Brit. M. J. **1:** 250–251, Jan. 21, 1903.

16. GREIG, D. M.: Congenital Microcolon. Edinburgh M. J. **32:** 175–206, April 1925.

17. HIATT, R. B., AND WILSON, P. E.: Celiac Syndrome: Therapy of Meconium Ileus. Surg., Gynec. & Obst. **87:** 317–327, September 1948.

18. HUNT, H. B.: Roentgenological Aspects of the Congenitally Small Colon and of Intestinal Occlusions. Am. J. Roentgenol. **41:** 564–574, April 1939.
19. ITOIZ, O. A., AND OTERO, E. R.: Microcolon Congenito. Arch. Soc. argent. de anat. norm. y pat. **3:** 79–85, 1940.
20. KLEINER, S. B.: Microcolon. Report of a Case. Tr. Am. Proct. Soc. **41:** 147–150, 1940.
21. KLINEFELTER, E. W.: Congenital Absence of the Colon. Am. J. Dis. Child. **50:** 454, August 1935.
22. KREUTER, E.: Zur Aetiologie der congenitalen Atresien des Darms und Oesophagus. Arch. f. klin. Chir. **28:** 303–309, 1908–1909.
23. KREUTER, E.: Die angeborenen Verschliessungen und Verengerungen des Darmkanals im Lichte der Entwicklungsgeschichte. Deutsche Ztschr. f. Chir **79:** 1–89, 1905.
24. LADD, W. E., AND GROSS, R. E.: Abdominal Surgery of Infancy and Childhood. Philadelphia, W. B. Saunders Co., 1941.
25. LEE, C. M., JR., AND MACMILLAN, B. G.: Rupture of the Bowel in the Newborn Infant. Surgery **28:** 48–66, July 1950.
26. LEE, C. M., JR., BEBB, K. C., AND BROWN, J. R.: Selective Management of Megacolon in Infancy and Childhood. Surg, Gynec. & Obst. **91:** 281–295, September 1950.
27. MCKEOWN, K. C., AND HOLMAN, C. A.: Case of Congenital Microcolon. Brit. M. J. **1:** 115–116, Jan. 22, 1944.
28. MILLER, E. M.: Bowel Obstruction in the New Born. Ann. Surg. **110:** 587–605, October 1939.
29. OSIANDER: Neue Denkwurdigkeiten. Goettingen. Vol. I, 1797. Quoted by Greig (16).
30. PORTER, L., AND WEEKS, A.: Megacolon and Microcolon. Am. J. Dis. Child. **9:** 283–299, April 1915.
31. POTTS, W. J.: Congenital Atresia of Intestine and Colon. Surg., Gynec. & Obst. **85:** 14–19, July 1947.
32. RANKIN, F. W., BARGEN, J. A., AND BUIE, L. A.: The Colon, Rectum and Anus. Philadelphia, W. B. Saunders Co., 1932.
33. REBELL, F. G.: Congenital Microcolon—Report of Two Cases. Ann. West. Med. & Surg. **1:** 160–164, June 1947.
34. ROBERTSON, H. E., AND KERNOHAN, J. W.: Myenteric Plexus in Congenital Megacolon. Proc. Staff Meet., Mayo Clin. **13:** 123–125, Feb. 23, 1938.
35. SIMS, G. K., AND MEYERS, H. L.: Report of a Case of Congenital Malformation and Arrested Development of the Colon. Am. J. Obst. & Gynec. **12:** 887–889, December 1926.
36. STEPHENSON, F. B.: Microcolon. Radiology **27:** 494–497, October 1936.
37. Stedman's Practical Medical Dictionary, edited by N. B. Taylor. Baltimore, Williams & Wilkins, 16th ed., 1946.
38. SWENSON, O., AND LADD, W. E.: Surgical Emergencies of the Alimentary Tract of the Newborn. New England J. Med. **233:** 660–663, Nov. 29, 1945.
39. SWENSON, O., RHEINLANDER, H. F. AND DIAMOND, I.: Hirschsprung's Disease: A New Concept of the Etiology. New England J. Med. **241:** 551–556, Oct. 13, 1949.
40. TIFFIN, M. E., CHANDLER, L. R., AND FABER, H. K.: Localized Absence of the Ganglion Cells of the Myenteric Plexus in Congenital Megacolon. Am. J. Dis. Child. **59:** 1071–1082, May 1940.
41. WHITEHOUSE, F. R., AND KERNOHAN, J. W.: Myenteric Plexus in Congenital Megacolon. Arch. Int. Med. **82:** 75–111, July 1948.
42. ZIMMER, J.: Microcolon. Acta radiol. **29:** 228–236, 1948.

SUMARIO

Lo Falaz en el Diagnóstico de Microcolon en el Recién Nacido

Los AA. señalan el error cometido al considerar el microcolon como entidad clínica, habiendo sido aceptado frecuentemente como anomalía congénita insusceptible de corrección quirúrgica. En realidad, todos los casos descritos en la literatura han sido secundarios a oclusión intestinal *in utero*, por lo general en forma de atresia congénita o de íleo mecónico asociado a fibroquiste del páncreas. Como el colon distal a la oclusión jamás ha contenido meconio o llenado su misión de conducto alimenticio, ha permanecido, por consiguiente, aplastado y sin funcionar. Por lo tanto, hay que emplear la palabra microcolon, si es que se usare, como término puramente descriptivo, para indicar la presencia de una anomalía subyacente que puede habitualmente corregirse con la cirugía apropiada.

Preséntanse 3 casos. En dos, la laparotomía exploradora condujo a un diagnóstico de microcolon; a consecuencia de la tergiversación reinante no se hizo más cirugía y los enfermitos murieron. En el tercer caso, se descubrió una atresia del colon transverso, se practicó una resección, seguida de una anastomosis latero-lateral, y a los once meses el niño se hallaba en buen estado, desarrollándose normalmente y con deposiciones espontáneas cada día.

Tissue Dose in Irradiation of the Breast[1]

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IRRADIATION of the breast is carried out by a great variety of technics in different radiotherapy centers. The very number of such methods indicates that no one can be accepted as more effective or more widely applicable than another. Because of variations in stage of the disease and radiosensitivity of the tumor, comparison of results is impossible for any but large series of cases. There is, however, one factor which may be directly compared, *i.e.*, the tissue dose.

When carcinoma of the breast is treated by radiotherapy, radiation is usually delivered through two or more portals tangential to the chest wall. Such a method might be recorded as in Figure 1. The determination of tissue dose delivered in this manner is difficult for two reasons. (1) Standard depth dose tables are not intended for tangential beams directed to irregular objects. They are designed for the estimation of a dose delivered when the portal is applied directly to the flat surface of a bulk of tissue large enough to provide the maximum scattered radiation which contributes importantly to tissue dose. (2) The error in attempting to duplicate the position and direction of the tangential beam from day to day during the course of treatment may be appreciable.

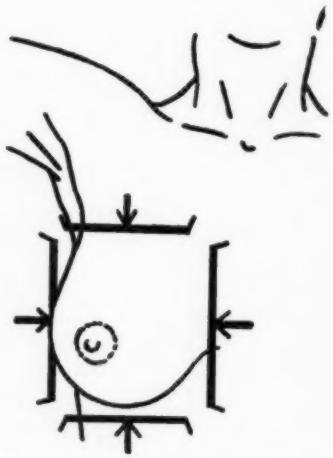


Fig. 1. Conventional method of recording treatment fields.

These objections may be overcome by the use of two devices which are employed in some centers. Bolus material may be used to build up irregular parts to a bulk of uniform density. Rice, or rice flour

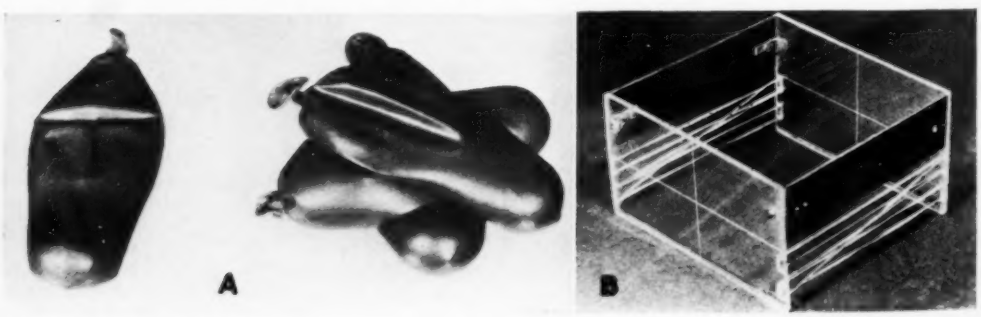
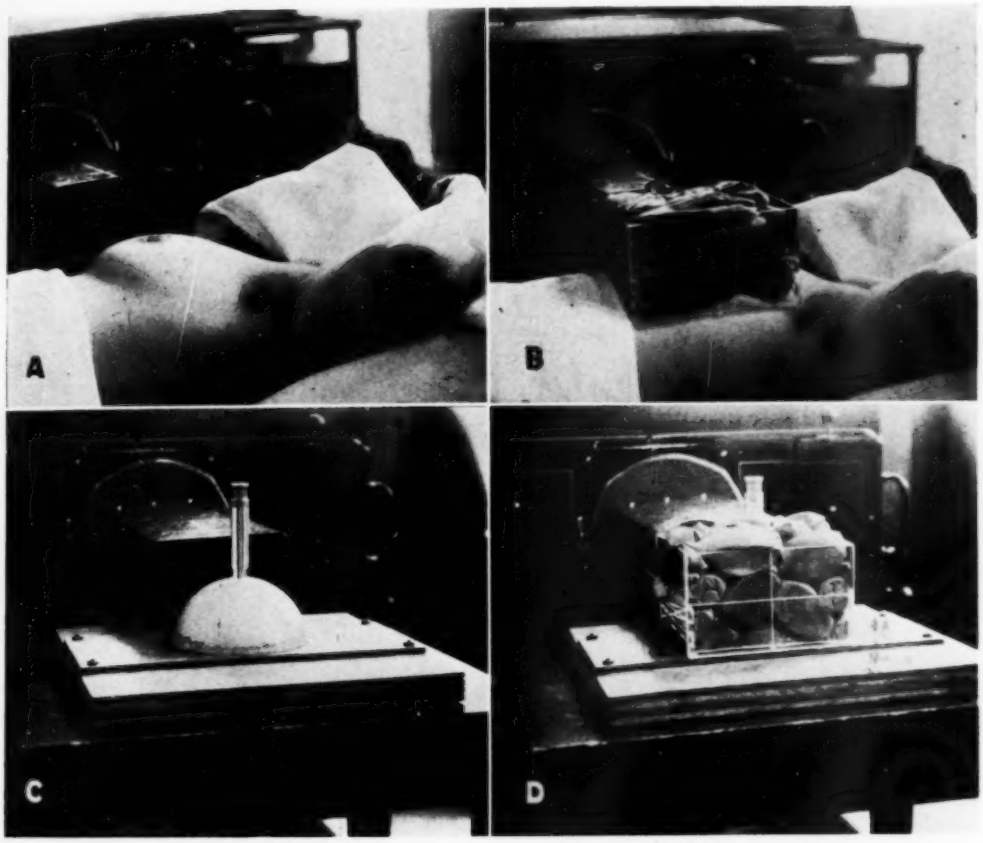


Fig. 2. A. Rubber balloons containing water as bolus material. B. Plastic box which serves to hold bolus material in place and to control beam direction and separation.

[1] From the Department of Radiology of the College of Physicians and Surgeons, Columbia University, and the Radiological Service of the Presbyterian Hospital, New York. Presented at the Thirty-fifth Annual Meeting of the Radiological Society of North America, Cleveland, Ohio, Dec. 4–9, 1949.



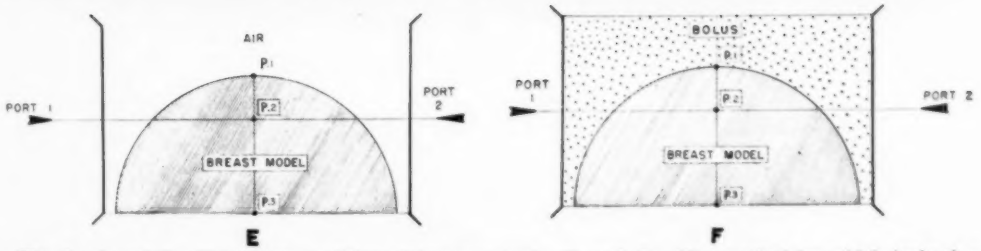


Fig. 3. A and B. Treatment conditions being compared. C and D. The method by which ionization measurements were made in a breast model. E and F. Diagrammatic representation of the conditions of treatment and measurement.

and sodium bicarbonate (2), in small bags is commonly used. We have used rubber balloons filled with water (Fig. 2A). Water is the ideal unit density material, and rubber balloons are convenient and durable and mold readily to each other and to irregular skin surfaces. For beam direction, boxes or frames have been employed (1). A design we have adopted (Fig. 2B) has two plastic end pieces for contact with the end of the treatment cone, and elastic side walls for adaptation to the body contour. A 10 × 15-cm. cone directly applied to the plastic end piece, first on one side and then on the other, will assure directly opposed beams at a constant separation of 16 cm. If the breast is thus enclosed and the box filled

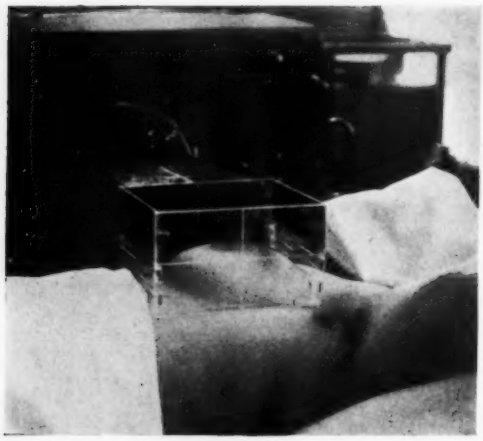
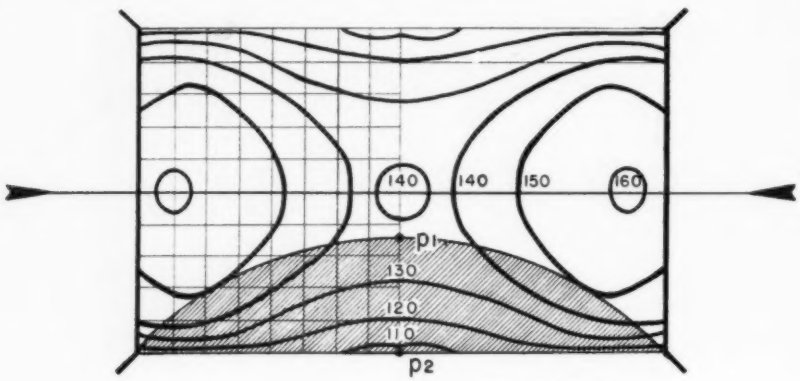


Fig. 4. Patient in position for determination of contour of breast.

avoid over-irradiation. A knowledge of the minimum dose is necessary, since an inadequate dose in the periphery of the irradiated field may be responsible for unsuccessful treatment. It is a surgical principle to resect a wide margin of normal tissue because of possible microscopic direct extension or lymphatic spread of cancer. If the radiotherapist is to observe the same principle, the dose delivered to the periphery is as important as that delivered to the evident tumor. A little radiation does not destroy a little tumor.

In order to determine the range of dosage delivered to various parts of the breast, a model was constructed of unit density plastic material. This was drilled to accept a standard Victoreen chamber at



	P1	P2
For 100 r in air to each port	125	110
For 8900r in air to each port	5265	4290

Treatment time = 16 days

Fig. 5. Treatment record of an individual case (N. K.). This represents the dosage distribution between two 10 × 15-cm. ports directly opposed and separated by 16 cm. The factors are 250 kv.p., 15 ma., filtration 0.5 mm. Cu, h.v.l. 1.5 mm. Cu, target-skin distance 70 cm. The tissue dose at any point may be read directly as roentgens per 100 r in air delivered to *each* of two ports.

with bolus material, standard depth dose data become applicable.

There is an objection to the expression of tumor dose as a single value. This is usually given for the point of intersection of the central rays of two or more beams, a point which receives neither the maximum nor the minimum radiation delivered throughout the irradiated tissue. A knowledge of the maximum dose is desirable to fixed points. Measurements were then taken under treatment conditions with and without bolus material for comparison with values predicted from isodose curves.

Figure 3 illustrates the treatment conditions simulated in the measurements and the diagrammatic representation of the irradiated fields.

In the diagrams, P.1 represents the region of the nipple, P.2 the central point

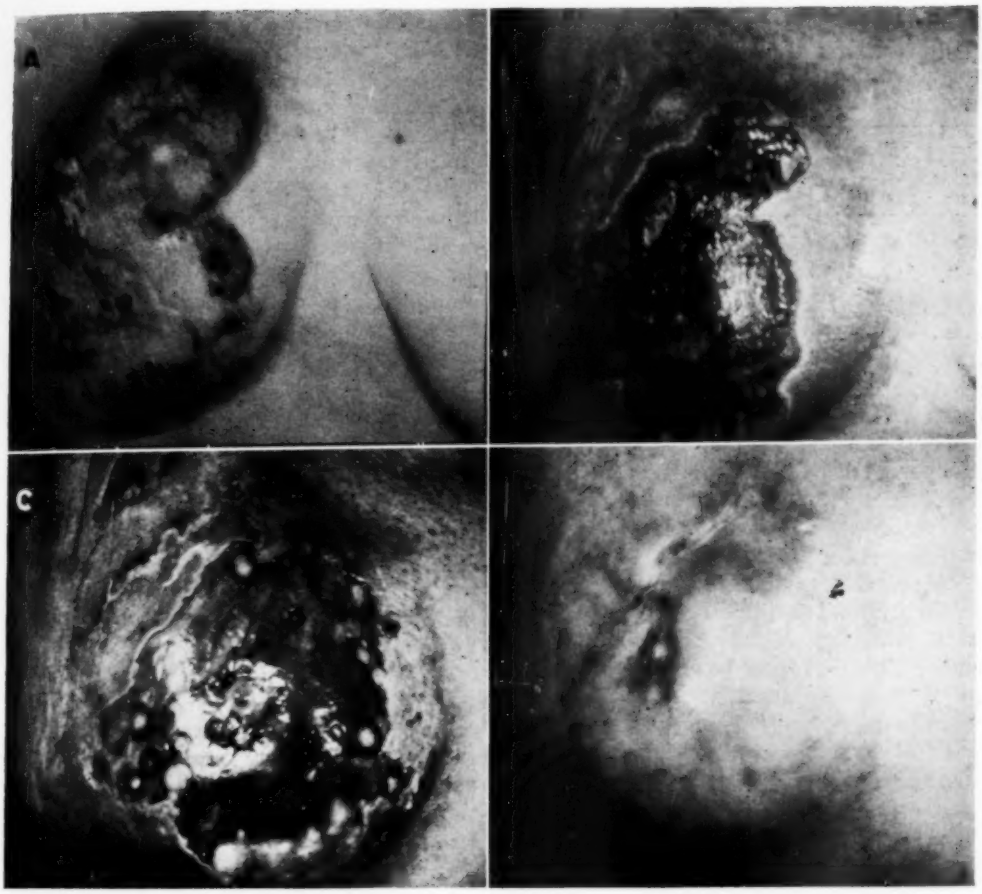


Fig. 6. A. Lesion of patient N. K. before treatment. B. Maximum radiation reaction two weeks after treatment. C. Beginning epithelization three weeks after treatment. D. Complete healing of radiation reaction thirteen weeks after treatment.

on the axis of the opposed beams, and P.3 the chest wall. Table I shows the dosage delivered at these points for 100 r in air delivered to each of the two opposing ports. The factors are 250 kv.p., 15 ma., filtration 0.5 mm. Cu, h.v.l. 1.5 mm. Cu, target-skin distance 70 cm.

The significant features of these measurements are:

1. The measured dose at P.2 along the central axis of the opposed fields irradiated either with or without bolus material corresponds well with the predicted value.

2. When radiation is delivered without bolus material and dose is expressed as a single value at the intersection of the axes of the beams, the dose received at the nipple might be greater by 30 per cent and the dose received at the chest wall less by 30 per cent, than that recorded. If tissue tolerance at the nipple is not exceeded, the chest wall may receive less than an adequate dose.

TABLE I: DOSAGE VALUES OBTAINED AT FIXED POINTS PER 100 R IN AIR TO EACH OF THE TWO OPPOSING FIELDS

	Without Bolus	With Bolus	Predicted*
P. 1 (nipple)	175 r	130 r	132 r
P. 2 (on central axis)	130 r	132 r	140 r
P. 3 (on chest wall)	102 r	107 r	110 r

* From isodose charts prepared in 30 cm. presdwood phantom.

TABLE II: DOSE DELIVERED IN SUBSTANCE OF BREAST PER 100 R DELIVERED TO THE NIPPLE REGION (P.1)

	Without Bolus	With Bolus	Percentage Increase with Bolus
P. 2 (on central axis) received	74 r	102 r	38
P. 3 (on chest wall) received	64 r	83 r	30

3. When bolus material is used, the measurements show a more nearly uniform dose throughout the breast. The measured amount at all three points corresponds closely to the values predicted on the basis of isodose charts.

These findings are expressed in another manner in Table II, in which the doses received at P.2 and P.3 for 100 r delivered to P.1, with and without the use of bolus material, are compared.

In practice, the method may be applied to breasts of varying size or to the chest wall following radical mastectomy. In some instances larger boxes may be necessary. The contour of the breast and the degree to which it protrudes into the field of irradiation are determined by sighting through the frame, as illustrated in Figure 4. This is recorded by drawing the contour on a diagram of the field of irradiation as in Figure 5, which is the treatment record of a small breast. The result of treatment in this patient is illustrated in Figure 6. The purpose of this illustration is not to demonstrate the effectiveness of the method of treatment but rather to show that, with a comprehensive record of the dosage that produced the reaction, a basis is established for duplicating or improving the result obtained.

SUMMARY

Results of irradiation of the breast might be better compared and evaluated if the tissue dose delivered throughout the breast were comprehensively expressed. This is possible by the use of bolus material and by aids to beam direction.

By the use of bolus material a more uniform irradiation is obtained, with appreciable improvement in tissue dose delivered.

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REFERENCES

1. ALLCHIN, F. M., AND WILSON, C. W.: Irradiation Treatment of Carcinoma of the Breast. Brit. J. Radiol. **21:** 406–413, August 1948.
2. SPIERS, F. W.: Materials for Depth Dose Measurements. Brit. J. Radiol. **16:** 90–97, March 1943.

SUMARIO

La Dosis Histológica en la Irradiación de la Mama

En la radioterapia de los tumores de la mama, la irradiación suele ser entregada a través de dos o más puertas tangenciales a la pared torácica. Esto dificulta la determinación de la dosis tisular, porque: (1) las tablas tipas de dosis profunda no están destinadas a haces tangenciales asestados a un objeto irregular y (2) son susceptibles de errores los esfuerzos hechos para duplicar la posición y dirección del haz de rayos de día en día.

Para remediar esas dificultades, ofrécense dos expedientes, o sean, el empleo de bolos en forma de balones de caucho llenos de agua para dotar a las partes irregulares de un volumen de espesor uniforme y el empleo de cajas de extremos plásticos y paredes elásticas que ayuden a encaminar los haces de rayos. Una vez encerrada la mama en la caja, que se llena con los bolos, encuentran aplicación los datos tipos para dosis profunda y hay la seguridad de obtener haces opuestos separados por una distancia constante. Lógrase así una irradiación más uniforme con mejoramiento apreciable en la dosis histológica.

Treatment of Cancer of the Breast[1]

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THE TREATMENT OF cancer of the breast requires co-operation of the physician, surgeon, radiologist, and pathologist. Those who examine patients with manifestations indicative of disease of the breast should be capable not only of making a differential diagnosis and suspecting the possibility of cancer when tumors are present but also of deciding the most beneficial method of treatment. Surgeons and physicians should recognize the limitations of surgery for cancer and radiologists be aware of the indications for operation. The pathologist must not only make microscopic examinations for diagnosis but should also determine the extent of involvement by means of his studies of all tissues, including every lymph node.

Surgical procedures have been used for centuries in cancer of the breast, but it was only a little more than fifty years ago that few, if any, patients were cured. At that time Halsted and Willy Meyer described the technic and results of radical mastectomy. Since then results have improved materially. At about the same time roentgen rays and radium were discovered and later were found to have carcinocidal effects, and therefore to be useful in treatment of cancer of the breast. There have nevertheless been disagreement and uncertainty regarding the indications, benefits, and results of irradiation. This is due principally to reports comparing surgical and radiological procedures without classification of cases according to the anatomic extent of involvement. There can be little doubt that patients are usually referred to radiologists only when in advanced stages of disease, with recurrences or metastases, or when they are surgically incurable. The results of irradiation for such cases cannot be compared with the outcome in less extensive involvement which has been treated surgically.

Several methods of classifying cancers of the breast based on their clinical manifestations have been suggested. One of these consists of dividing cases into the "operable" and "inoperable." There are differences of opinion, however, regarding these terms and their definitions. All cancers of the breast can be attacked surgically, but whether or not a patient should be operated upon may depend upon the surgeon's estimate of his own skill rather than his ability to benefit the patient. Also, there are cancers of the breast of extensive involvement but without clinical manifestations which will prove to be incurable after examination of tissues removed. For example, there may be metastases in many axillary lymph nodes which could not be found clinically. For this reason, classifications based upon clinical criteria alone are not satisfactory in determining the indications and limitations of different methods of treatment on the basis of statistical results.

Pathologists have classified cancers of the breast into several histologic types and attempted to grade them for prognosis according to degrees of differentiation. Many cancers of the breast, however, are a mixture of histologic types and degrees of differentiation. Also, a cancer of presumably high malignancy may be limited and therefore curable, whereas a low-grade highly differentiated cancer may be incurable because of the degree of extension. Therefore, classifications based on pathologic criteria alone are also unsatisfactory as a guide to treatment or a basis for comparison of results.

Undoubtedly the most satisfactory

[1] From the Cleveland Clinic and the Frank E. Bunts Educational Institute. Presented before the Thirty-fifth Annual Meeting of the Radiological Society of North America, Cleveland, Ohio, Dec. 4–9, 1949.

method of classifying cases of cancer of the breast is to weigh all clinical and pathologic evidences of the extent of involvement. With such a classification, it will be possible to decide upon the indications and limitations of different therapeutic procedures and make equitable comparisons of results obtained. The following classification based on both clinical and pathologic manifestations was developed in 1937 for an analysis of our series of cases.

Group or Stage I
Skin: Not involved
Tumor: Localized in breast and movable
Metastases: None in axillary nodes or elsewhere
Group or Stage II
Skin: Not involved
Tumor: Localized in breast and movable
Metastases: Few axillary nodes involved; no metastases elsewhere.
Group or Stage III
Skin: Edematous: brawny red induration or inflammation not obviously due to infection; extensive ulceration; multiple secondary nodules
Tumor: Diffusely infiltrating breast; fixation of tumor or breast to chest wall; edema of breast; secondary tumors
Metastases: Many axillary nodes involved or fixed. No clinical or roentgenologic evidences of remote metastases
Group or Stage IV
Skin: As in any other group or stage
Tumor: As in any other group or stage
Metastases: Axillary and supraclavicular nodes extensively involved. Clinical or roentgenologic evidences of remote metastases

In many instances it will be impossible to differentiate clinically between benign and malignant neoplasms, although the rate of growth and age of the patient may indicate the probable character of the tumor. Under such circumstances, biopsy and microscopic examination of the tissues are necessary.

Biopsy of small, localized, movable tumors of the breast by aspiration or similar methods is not always reliable and may lead to erroneous conclusions. Occasionally benign and malignant tumors may be present concomitantly and near each other. A carcinoma may be cystic or a cyst may contain carcinoma. Aspiration in such cases may reveal only benign tissue or cystic fluid even when cancer is present. When this occurs an erroneous diagnosis may be made, resulting in improper treatment. Aspiration biopsies are satisfactory, however, for confirming diagnosis in cases with frank clinical manifestations of cancer.

When there is doubt about the character of a small breast tumor, the safest procedure for biopsy is immediate excision and microscopic examination. If the tumor is benign, no other treatment is necessary; if malignant, the surgeon must decide how to proceed. In most cases, radical mastectomy will be performed in order to investigate and remove the axillary contents since even a small cancer may metastasize to the axillary nodes without clinical manifestations.

If, after microscopic examination of each lymph node, no evidence of metastases is found, the case may be classified as of Group or Stage I. Approximately 25 per cent of all cases operated upon will be in this category, and the general average of five-year survivals will be almost 85 per cent following operation alone. About 15 per cent of the patients, however, in whom no involvement of axillary lymph nodes was detected even microscopically will die of cancer within five years. The reason is that not all the cancer was removed even in these early cases or the growth had metastasized to other tissues than the axillary nodes. This may be true of inner quadrant neoplasms, which extend to the internal mammary, parasternal, and anterior mediastinal nodes. Also metastases in axillary nodes may escape the examination of pathologists. Saphir and Amromin (1) restudied axillary lymph nodes of 30 patients with cancer of the breast that on routine microscopic examination had been reported uninvolved and in serial sections found cancer cells in 33 per cent.

It is illogical to give preoperative roentgen therapy to a localized tumor in the breast before the correct diagnosis has been established; this may best be done by complete excision. Also, routine postoperative treatment is unnecessary for

Stage I cases since the curability rate by operation alone is high. Furthermore, there is no way to tell, in cases which will not be cured surgically, where the residual cancer tissue or metastases are located nor what regions to treat. Some surgeons, however, advise postoperative roentgen therapy even for Stage I cases. They fear undetectable metastases in lymph nodes and possible criticism by patients who might subsequently develop metastases. In our experience postoperative roentgen therapy of Stage I cases has not increased survival rates.

Clinically undetectable metastases to axillary lymph nodes may be found after operation in patients with small, localized, movable cancers. Radical mastectomy was justifiable, nevertheless, because of the uncertainty about the true character of the tumor or extent of involvement prior to operation. When only a few nodes are found to be involved, perhaps 25 per cent of all of them, the case may be classified in Group or Stage II because the prognosis is less favorable than if no nodes are involved. About 25 per cent of cases operated upon will be in this category, and with operation alone the general average of five-year survivals will be less than 50 per cent.

Neither is preoperative roentgen therapy indicated for Group II cases, because the diagnosis cannot be established until after operation. Postoperative roentgen therapy should be given, especially to the axilla and supraclavicular regions, since it may delay the growth of undetected cancer in these areas.

Although local recurrences in the chest wall or axilla seldom occur in cases of Stage I or II, it is obvious that extension must take place beyond the anatomic limits of operation since at least 50 per cent of the latter group die of cancer within five years. The most common route of metastasis is to the axilla or infraclavicular nodes and then to the supraclavicular group. Therefore, since there is adequate proof that roentgen rays destroy some cancer cells and delay growth of malignant tissue, it would seem logical to administer treatment postoperatively to the regions where metastases may have taken place. Although this procedure may not cure, because cancers of the breast are inherently radioresistant, it will increase the five-year survival rate approximately 10 to 15 per cent of Stage II cases.

There is disagreement even among radiologists about the value of postoperative roentgen therapy, but there are few statistical reports based on properly classified cases from which satisfactory conclusions may be drawn. However, we constantly urge early treatment of cancer. Therefore, when residual cancer is known to exist, as it does in at least 50 per cent of Group II patients operated upon, it would seem advisable, logical, and necessary to attack it immediately by the only method available, radiation therapy, even though the percentage of survivals is not increased remarkably.

Amazingly, some surgeons have contended that recurrences or metastases appear sooner than would be expected in patients given postoperative irradiation. These conditions develop in spite of the treatment and indicate that cancer tissue remained after the operation, which was unsuccessful as far as cure is concerned. Recurrences and metastases may develop a few weeks or years after operation, and no one can foresee when this will occur. Actually there is abundant experimental and clinical proof that irradiation may inhibit the development of cancer cells, or destroy them, and that irradiated tissues resist their growth, but unfortunately irradiation does not always cure.

Some patients appear to have localized tumors of the breast, normal skin, and no clinical evidence of metastases, but it is evident after operation that many axillary lymph nodes are involved. Although operations were justifiable in these cases, the prognosis is no more optimistic than for patients with clinical evidence of more advanced disease. Since the five-year survival rate is in direct proportion to the

number of lymph nodes involved, patients with metastases in many nodes may be classified in Group or Stage III. The general average of five-year survivals after operation alone for such cases is not more than 15 per cent. This can be increased by postoperative roentgen therapy in about 10 per cent.

Malignant tumors of the breast begin as localized masses of neoplastic cells which, as they grow, progressively increase the size of the masses and invade surrounding tissues. Eventually the invasion will manifest itself clinically in a number of ways, in the skin, in the degree of involvement of the organ and underlying tissues, and as metastases to regional lymph nodes. These clinical signs of extent of involvement, some of which have been listed in the classification for Group or Stage III, are indications of advanced incurable disease, which will be discussed later. About 30 per cent of all cases in our series were in this category when first examined. The general average of five-year survivals following operation alone was approximately 5 per cent, increased by roentgen therapy to 10 to 15 per cent.

Another Group or Stage IV must be made to include patients who have remote metastases on initial examination, whether or not there are local manifestations of advanced disease. The metastases may be found in the lungs or bones by routine roentgenologic examinations, which should be made of every patient prior to treatment. Also included in this category are patients with palpable enlarged supraclavicular nodes, involvement of the opposite breast or contralateral lymph nodes, or clinical evidence of involvement of other viscera such as the liver or brain. Approximately 20 per cent of all cases in our series had evidence of remote metastases on initial examination. These cases are incurable and should not be operated upon About 5 per cent may survive five years without treatment, but irradiation will be palliative.

Groups III and IV have constituted almost 50 per cent of the cases of primary cancer of the breast we have seen, and the survival rate following the operation alone has been no higher than the average life expectancy of patients who have had no treatment. This observation led me, in 1937, to evolve what I call the "Criteria of Incurability," which are listed in simple form:

The Skin

1. Edema (orange or pigskin) of more than slight extent
2. Ulceration of more than slight extent
3. Brawny red and inflamed, not obviously due to infection

The Breast

1. Diffusely edematous
2. Diffusely infiltrated
3. Secondary tumors
4. Fixation of tumor or breast to chest wall

Metastases

1. Axillary lymph nodes numerous, extensively involved and fixed
2. Supraclavicular lymph nodes or edema of the arm
3. Involvement of contralateral breast or lymph nodes
4. Remote metastases in bones, lungs, or other viscera

The presence of the signs listed in these "criteria" should be looked for when examining women with tumors of the breast. There is abundant proof that life may actually be shortened by dissemination when cancer is incised. Anyone referring patients for surgery or attempting to operate (especially upon women with any of these criteria) should consider the following quotation from an eminent surgeon and a collaborating pathologist (2): "The widespread disrepute in which cancer surgery is held by laity is due in large measure to a willingness on the part of some surgeons to accept hopelessly advanced cases for radical operations—the indications for palliative operations are seldom met with—and in the absence of such, any operation, the purpose of which is merely to remove as much malignant tissue as possible, or in cases where complete removal is clearly out of the question, should be strongly condemned. Operations of this type contribute nothing to the comfort of the patient nor prolonga-

tion of life; on the contrary, the end frequently is hastened by exciting the disease to more active growth."

The foregoing discussion and quotation bring up the question of how patients with such signs of incurability should be treated. The only available methods of proved efficiency or possible cure are roentgen ray, radium, and endocrine therapy for palliation. Patients in this classification should, therefore, be referred to radiologists for treatment. Adequate irradiation of patients with incurable breast cancer will result in approximately 15 per cent five-year survivals; more survive each year than among those operated upon or not treated. Although irradiation may not cure, it will be palliative and prolong the lives and economic usefulness of many patients.

In some of the patients adequately irradiated, the cancers and lymph node metastases become smaller or no longer palpable and the breast fibrosed. Indications such as these encourage an inclination to operate. In our experience, operations following irradiation for incurable cancer have invariably revealed neoplastic tissue still present in lymph nodes and a well fibrosed breast. It is my impression that these patients did not survive so long as they might have if no operation had been performed. It may be concluded that irradiation does not make patients with "criteria of incurability" surgically curable.

The technic of radiologic procedures need not be discussed, although it may be of interest to mention sex hormone therapy. Sterilization by roentgen irradiation may be considered a form of hormone therapy. Roentgen sterilization should be performed for all patients still menstruating who show some criteria of incurability or who have local recurrences or remote metastases. The progress of the disease seems to be delayed by sterilization frequently enough to warrant its use as a routine procedure in such cases. The question of sterilizing women with metastases limited to the lymph nodes depends upon the extent of involvement and the age of the patient. Sterilization is not advisable for young women when metastases are found only in a few axillary nodes or until more remote metastases appear. Although pregnancy may hasten the development of cancer of the breast, many women with minimal axillary involvement have given birth to children without ill effects. Women approaching the menopause, however, are grateful for cessation of the menses.

After sterilization, some women complain of vasomotor disturbances or "hot flashes." It is not advisable to administer hormone therapy for relief in these cases, since false menstruation manifested by slight irregular vaginal bleeding may be induced and the cancer stimulated. Sedative medications are preferable.

Many women with local recurrences of mammary cancer, metastases, or other incurable indications are benefited by administration of sex hormones. Since it has been proved experimentally and clinically that estrogens may induce cancer of the breast and stimulate the rate of growth, it seems paradoxical that large doses also cause an opposite effect, resulting in retardation of the disease, especially in soft tissues of older women. Stilbestrol may be given orally in doses of from 10 to 30 mg. per day. This has resulted in improvement and regression of primary cancers, recurrences, and lymph node and pulmonary metastases, with a consequent sense of well-being in a number of cases. The results are inconsistent, however, and are best in women sixty years of age or older. In young women there is danger of accelerating the disease.

Androgens seem to be more effective for young women and for patients with osseous metastases. Primary tumors and lymph node metastases also may be influenced beneficially and diminish in size. We have used testosterone propionate intramuscularly, 100 mg. three times a week, but half this dose may be effectual. In some cases, spectacular relief of pain from

osseous metastases has resulted in a few days, but in other patients benefit has not been observed for two or three weeks. In the meantime, there is often improvement in appetite, gain in weight, a sense of well-being and increase in strength; the results, however, are variable. In not a few cases the roentgenologic appearance of osseous metastases changes, with apparent new bone formation. In others, symptomatic relief may be obtained without change in the appearance of metastatic lesions. Unfortunately in some patients the entire disease process seems to be accelerated.

CONCLUSIONS

1. Cases of cancer of the breast may be and should be classified according to clinical and pathological manifestations of anatomic extent of involvement in order to determine the indications and limitations of different therapeutic procedures and their results. A classification is suggested.

2. Patients without "criteria of incurability" should be operated upon. When axillary nodes are involved, postoperative roentgen therapy should be given.

3. Patients with more than one indication listed in the "criteria" should be treated by radiological procedures alone.

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REFERENCES

1. SAPHIR, O., AND AMROMIN, G. D.: Obscure Axillary Lymph-Node Metastasis in Carcinoma of the Breast. Cancer 1: 238–241, July 1948.
2. DEAVER, J. B., AND MCFARLAND, J.: The Breast: Its Anomalies, Its Diseases, and Their Treatment. Philadelphia, P. Blakiston's Son & Co., 1917, p. 567.

SUMARIO

Tratamiento del Cáncer de la Mama

A fin de determinar las indicaciones de distintos procedimientos terapéuticos en el cáncer mamario, hay que clasificar los casos conforme a las manifestaciones clínicas y patológicas correspondientes al grado de invasión. Propónese la siguiente clasificación:

Grupo o Período I
- Piel: inafectada
- Tumor: localizado en la mama y movible
- Metástasis: no las hay en los ganglios axilares ni en otra parte

Grupo o Período II
- Piel: inafectada
- Tumor: localizado en la mama y movible
- Metástasis: en unos pocos ganglios axilares, pero no en otra parte

Grupo o Período III
- Piel: edematosa; induración roja callosa o inflamación manifiestamente no debida a infección; extensa ulceración; múltiples nódulos secundarios
- Tumor: infiltra difusamente la mama; fijación del tumor o de la mama a la pared torácica; edema de la mama; tumores secundarios
- Metástasis: muchos ganglios axilares invadidos o fijos. No hay signos clínicos o roentgenológicos de metástasis remotas

Grupo o Período IV
- Piel: lo mismo que en cualquier otro grupo o período
- Tumor: lo mismo que en cualquier otro grupo o período
- Metástasis: los ganglios axilares y supraclaviculares hállanse afectados en gran escala. Hay signos clínicos o roentgenológicos de metástasis remotas

Además, ofrécense ciertas pautas para determinar la inoperabilidad, siendo:

La Piel
1. Edema (anaranjado o de color de piel de cerdo) que pase de poca extensión
2. Ulceración que pase de poca extensión
3. Roja, callosa e inflamada, claramente no debido a infección

La Mama

1. Edematizada difusamente
2. Infiltrada difusamente
3. Muestra tumores secundarios
4. El tumor o la mama están fijados a la pared torácica

Metástasis

1. Numerosas en los ganglios linfáticos axilares, que están muy invadidos y fijos
2. En los ganglios linfáticos supraclaviculares o hay edema del brazo
3. Invasión de la mama contralateral o de los ganglios linfáticos contralaterales
4. Metástasis remotas en los huesos, pulmones u otras vísceras

Los enfermos en que no existen signos de inoperabilidad serán tratados quirúrgicamente, con irradiación postoperatoria si están invadidos los ganglios axilares.

Los enfermos en que hay presentes más de uno de los precitados signos de inoperabilidad serán tratados exclusivamente con la irradiación.

DISCUSSION

(Papers by Haagensen[1]; Collins; Portmann)

Grantley W. Taylor, M.D. (Boston, Mass.): It is a great pleasure to participate in such a scintillating presentation. I have made a few notes as the speakers have gone along, and I will briefly comment, although there is very little that I can criticize or differ with.

I think that Dr. Haagensen's criteria of operability, explicitly stated, have been of immeasurable benefit in the general management of the problem of mammary cancer. Those of Dr. Portmann coincide very closely. Others who have presented criteria have done it much less forcefully and much less dogmatically, but I think this is a subject which calls for dogmatic presentation, and I think, with the qualifications or modifications which Dr. Haagensen presented this afternoon, we are willing to go along with it.

One thing which was very interesting to me was that Dr. Haagensen presents an operability, at his clinic, on the basis of his criteria, of about 75 per cent. Our finding has been almost exactly the same, figuring around 70 per cent of the primary cases coming to us for treatment. And yet, all this time, we have been sharpening our criteria of operability. I think that may mean that the public is getting better educated, or the physicians better educated, but Dr. Haagensen's clinic has been recognized as primarily a surgical clinic, and the practitioners of the community are weeding out some of the less operable cases and sending them elsewhere for treatment.

We found, in Massachusetts, that with the opening of the Palmer Memorial Hospital and Huntington Hospital as places where radiological treatment was obtainable, our operability was definitely improved, in spite of the fact that we think we have narrowed our criteria.

We agree, also, with Dr. Haagensen, that it is very hard to control the members of our surgical staffs, who will insist on trying to operate in some cases which are probably inoperable. We agree further that some of the improvement in recent years in our results, and everyone else's, has been an improved recognition of the scope of a radical operation—an increased realization that it must be adequate. The falling off in operative mortality also bears witness to improved surgery, all of which contributes to better results.

I think that the quotation that Dr. Portmann dug out of Deaver and McFarland is a very apt one. Our surgery must be made to be successful surgery in order to gain the confidence of the community and not have people dreading the prospect of operation.

The point that Dr. Haagensen made about ten-year results—first it was five-year results—is also a very sound one. We know that there are always a few late recurrences. I am inclined to believe that they are less, perhaps, with surgery than with other methods of management, such as McWhirter's, for instance. I was delighted to hear Dr. Haagensen criticizing Dr. McWhirter throughout his discourse. I agree with him, completely, that McWhirter's opinions are retrogressive in regard to the management of mammary cancer. One point that Dr. Haagensen brought out, which I think should be emphasized, is that the incidence of local recurrence in the operative field has a definite relationship to the extent of the primary disease, especially as regards involvement of the regional nodes. I think the operative field recurrences are often not so much a reflection on the type of radical operation which is done as they are a reflection on the type of cancer that is present.

We have found, in correlating our local recurrences with axillary involvement and with the higher grades of malignancy, that the recurrences

[1] Paper not submitted for publication.

take place in the very highly malignant cases rather than those of excessive local extent. To be sure, operative field recurrence may be due to sloppy operative technic or improper selection of cases, but also there is the factor of the virulence of the primary disease, and that probably, again, is a reflection of the degree of permeation of lymphatics in the vicinity of the breast.

Dr. Collins was gracious enough to let me see his manuscript before this meeting. I must say that his method is most ingenious. It is in keeping with the progress of cubism and surrealism to treat a boxful of cancer. His pictures suggest a delicatessen store window, with little sausages in it. Actually, I don't say that in disparagement, for it seems to me a most important contribution to the management of these tumors to adjust the dose so that you are getting what you think you are getting, rather than to wish you had.

Going on to Dr. Portmann, I can't do anything but agree with essentially everything he said. Our own experience with postoperative irradiation has never been as happy with regard to deferment or suppression of recurrences. Actually, among cases which are successful, the recurrence takes place so infrequently within the field which would be irradiated by any course of postoperative prophylactic irradiation that we haven't felt it desirable to carry out treatment of a large group of patients for the possible benefit of those few in whom supraclavicular recurrence will take place.

Perhaps it is a little boastful to say that we do not see axillary recurrence in our experience. I think the operation should completely remove all of the structures likely to harbor metastases.

We agree with Dr. Haagensen, who deplored the incompleteness of many so-called radical mastectomies. I have found 19 lymph nodes still present in the axilla, after what was described as a radical mastectomy. As Dr. Lenz pointed out at a previous meeting, often the radiologist is called on to make superhuman efforts in an attempt to salvage the cases which are improperly handled by his surgical colleagues.

Dr. Portmann also stressed the quantitative relationship of axillary lymph node involvement to the prognosis. Analyzing the material at the Huntington Hospital, we made very similar observations, namely, that when there are only one or two axillary nodes involved, the prognosis is not very much worse than when there is no involvement. On the other hand, when a large number of nodes are involved, the prognosis is very poor. Even in those cases, however, we find that the eventual fatal outcome is due to remote metastatic disease, and that the incidence of operative field recurrence is relatively small.

Dr. Portmann touched upon the problem of prophylactic irradiation castration following radical mastectomy in young women. Some years ago, I studied a series of 50 young women in whom we had carried out prophylactic postoperative x-ray therapy of the ovaries, and it didn't appear to me, following those cases, that we had in any way improved the number of cures or deferred the onset of recurrence in those which were not going to be successful. And, it seems to me, that if the disease is latent and quiescent, it may be much less sensitive to the abrupt changes in the humoral environment to which a current and rapidly progressive process is responsive.

It seems reasonable to think of metastases almost in the same way that we think of bacteria in the spore form. We know that it is very hard to destroy spores and that it requires the most vigorous type of treatment. But in the vegetative stage of bacteria, a relatively minor change is frequently lethal.

We have carried out end-result studies of breast cancer at Massachusetts General Hospital, beginning with the group treated from 1894 to 1904, and our results following radical mastectomy have improved steadily. In the last series in which we have completed our study, we had 52 per cent five-year cures. I think that our operability on primary cases remains just about where it was, that is, 70 to 72 per cent. These improved results over the years have occurred not only in the patients with axillary involvement but also in the patients without axillary involvement. The most striking improvements, however, were in that group with axillary involvement, again due to better surgery and better selection of cases.

This brings out the point which Dr. Haagensen made, of the local recurrences being confined largely to the cases of higher grade malignancy. Grade 1 cases rarely present axillary metastases, and they are highly curable; Grade 2 lesions have axillary metastases more frequently but are much more curable than Grade 3.

Nephrography: Simplified Technic[1]

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ALTHOUGH THE kidneys are opaque to roentgen rays, their density is that of soft tissues in general and their roentgen image is difficult to distinguish from surrounding structures. Perirenal fat deposits are relatively radiolucent, thereby allowing limited examination of the renal outline by means of routine roentgenography. Even under favorable circumstances, however, the upper pole of one or both kidneys is occasionally indistinguishable. Artificial methods of increasing the density and contrast are called nephrography. The following have been developed and found to be effective.

A. *Abdominal Aortography:* dos Santos (1), and later Nelson (2), obtained increased renal opacity by direct translumbar injection of radiopaque medium into the abdominal aorta. Nelson was able to demonstrate bilateral hypernephromata when both intravenous and retrograde pyelography had failed. Abdominal aortography was used by Wagner (3) to delineate the arterial supply of a large renal tumor. This method necessitates the use of general anesthesia and has in one case been followed by death due to mesenteric arterial thrombosis (4).

B. *Intravenous Pyelography with Ureteral Obstruction:* When acute ureteral obstruction is present, the renal shadow is rendered more than usually radiopaque during intravenous pyelography. Hellmer (5), while studying this phenomenon, was able to recognize a renal cyst and a tumor as radiolucent areas in the opacified kidney. Obstruction of the ureter was artificially produced by Weens and Florence (6) by the dilatation of a balloon which had been introduced into the ureter, a procedure allowing them to obtain roentgenograms of the opacified kidney.

C. *Rapid Intravenous Injection of Concentrated Organic Iodide Solutions:* An abstract by Weens *et al.* (7) described the use of intravenous diodrast to produce nephrograms, but their results were not illustrated. The method of injection developed by Robb and Steinberg for contrast cardiovascular visualization was employed (8). The method to be described here is essentially the same.

MATERIAL AND METHOD

The preparation for nephrography is the same as that preceding routine intravenous pyelography. The evening before the examination, the patient receives one ounce of castor oil. If this is effective, no further preparation is necessary; if not, a tap water enema is administered the following morning. Fluids are restricted after midnight and breakfast is omitted.

At the time of nephrography, the patient is placed in the supine position on the roentgenographic table, and a preliminary film of the abdomen is made to ascertain the proper exposure factors and the adequacy of preparation. The usual roentgenographic factors are: 200 ma., 75 to 90 kv.p. (varying with the thickness of the patient), Potter-Bucky diaphragm, 40-inch target-film distance, and 0.3 second exposure.

A Robb-Steinberg 12-gauge needle is inserted into any readily accessible antecubital vein, and its position is checked by the injection of saline solution (8). If desired, sensitivity testing is then performed by the intravenous injection of 0.5 c.c. of neo-iopax (75 per cent) or diodrast (70 per cent). Ten minutes are allowed for the development of evidences of an unfavorable reaction.

When the preparations for the examina-

[1] From the Department of Radiology of The New York Hospital, Cornell Medical Center. This investigation was aided by a grant from the Schering Corporation. Accepted for publication in April 1950.

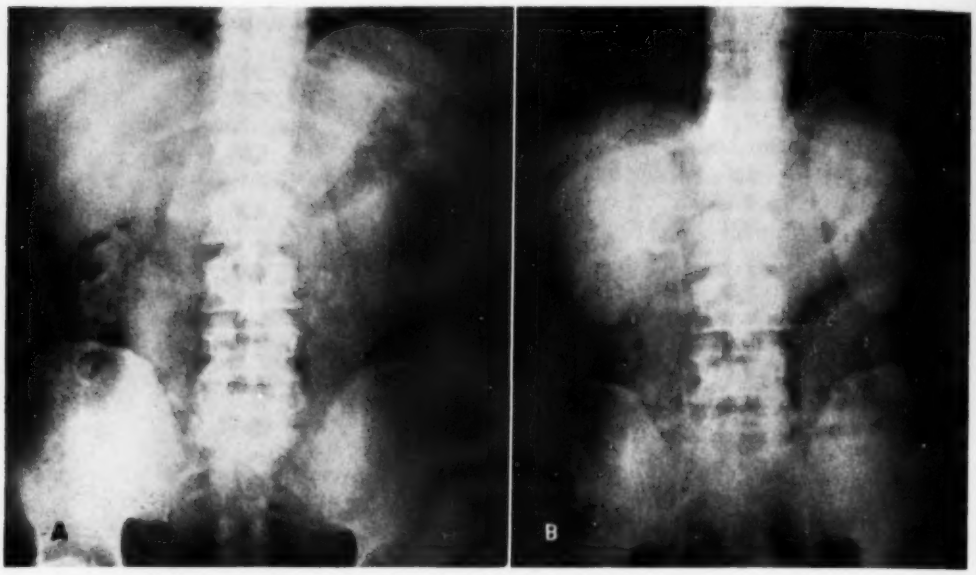

Fig. 1. Case 1. Conventional roentgenogram of abdomen (A) showing normal renal silhouettes. Compare their contrast with that in (B), following injection of neo-iopax.

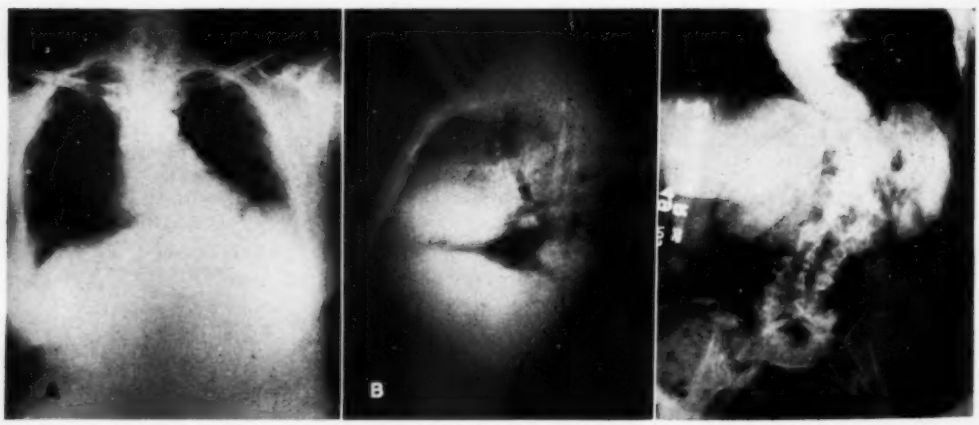

Fig. 2. Case 2. Chest roentgenogram (A) showing density in left lower lung field which, on lateral projection (B), is shown to lie posteriorly and beneath the diaphragm. C. Nephrogram localizing the density and demonstrating it to be the left kidney, the upper pole of which is even with the ninth rib posteriorly as it is in A.

tion have been completed, a special large-bore 50-c.c. syringe is filled with the contrast substance (neo-iopax, 75 per cent, or diodrast, 70 per cent) and attached to the injection needle. The patient is instructed to breathe out and then inspire deeply. During the deep inspiration, the entire contents of the syringe are discharged into the vein in less than two seconds. Simultaneously, a stop watch is started (by the x-ray technician) and sixteen to twenty-two seconds later a roentgenographic exposure of the abdomen is made. As soon thereafter as the cassette can be changed (usually in less than ten seconds), another film is exposed. Following the injection, the patient is allowed to breathe normally save for the time of the actual

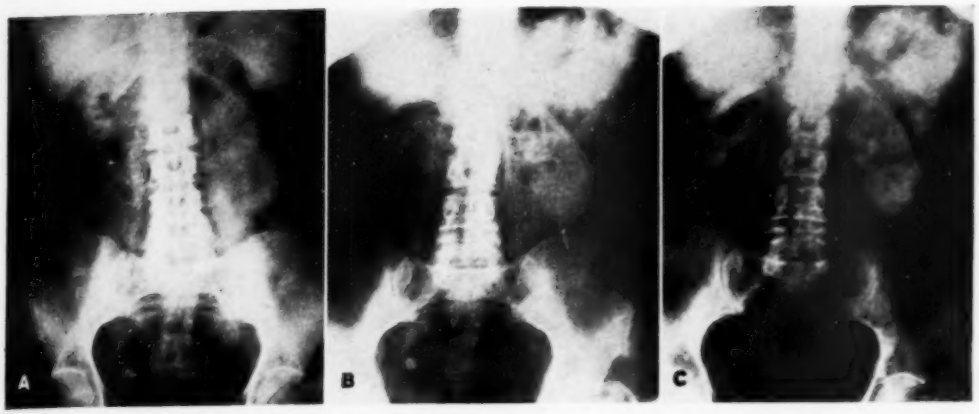

Fig. 3. Case 3. Roentgenogram of abdomen (A), with calcification in left upper quadrant, which is shown in the arterial phase (B) to be in the opacified splenic artery. C. Nephrogram, capillary phase, with opacified enlarged spleen and normal kidneys.

roentgenographic exposures, which are made in inspiration. The procedure should be carefully explained to the patient and every effort made to insure the co-operation of all participants before the injection is made. Delayed films of the abdomen may be made if demonstration of the calyces and ureters is desired.

RESULTS

This method has been performed in 25 cases. Satisfactory nephrograms were obtained in 18 instances. As experience with the procedure accumulated, the incidence of unsatisfactory examinations diminished. Five illustrative cases are briefly presented:

CASE 1: *Normal Nephrogram.* A 53-year-old white male was admitted to the hospital because of complaints unrelated to the urinary tract. There were no physical or laboratory indications of renal disease. Conventional roentgen examination of the abdomen was unremarkable (Fig. 1A). A normal nephrogram was obtained and serves to illustrate the degree of opacification possible with this method (Fig. 1B).

CASE 2: *Abnormal Renal Position.* A 51-year-old white married female was referred to the New York Hospital because of a left lower lung field density detected upon a routine chest roentgenogram. Fluoroscopy and further roentgenography of the chest demonstrated elevation of the left leaf of the diaphragm, with a soft-tissue shadow beneath it (Fig. 2A and B). Nephrographic study showed that this shadow represented the left kidney, which had shifted in a cephalad direction because of a marked scoliosis (Fig. 2C).

CASE 3: *Splenic Artery Aneurysm.* A 62-year-old white female was admitted to the hospital because of hypertension of many years duration. Although there was no striking clinical evidence of pheochromocytoma, a sensation of resistance was encountered on palpation of the lower left abdomen. On conventional roentgen examination of the abdomen (Fig. 3A), the left kidney was seen to be displaced downward, and a smaller circular calcification was identified in the left upper quadrant. Although this was considered to represent calcification in a small aneurysm of the splenic artery, doubt persisted, and nephrography was done. The nephrogram (Fig. 3B and C) not only outlined the splenic artery which contained the calcification, but also demonstrated normal opacification of both kidneys. In addition, the lower border of the spleen (rendered opaque by the injection) occupied a position more caudal than that usually seen. The patient was discharged with the diagnosis of essential hypertension.

CASE 4: *Renal Cyst.* A 55-year-old woman complained of hematuria of one week duration. At cystoscopy, bloody urine was seen to issue from the right ureteral orifice. A right retrograde pyelogram (Fig. 4A) was interpreted as showing "probable right renal tumor." Intravenous pyelography (Fig. 4B) demonstrated "possible tumor or cyst, left kidney." Nephrography was performed (Fig. 4C), and the interpretation was "benign left renal cyst; normal opacification of right kidney." Following subsequent bilateral retrograde pyelography, there was still thought to be distortion of the right mid-calyceal group. Operation was undertaken, and the left kidney was explored first. A large cystic mass, 8×6 cm., projected from the inferolateral border of the kidney. Immediate microscopic examination of a portion of the covering membrane showed a

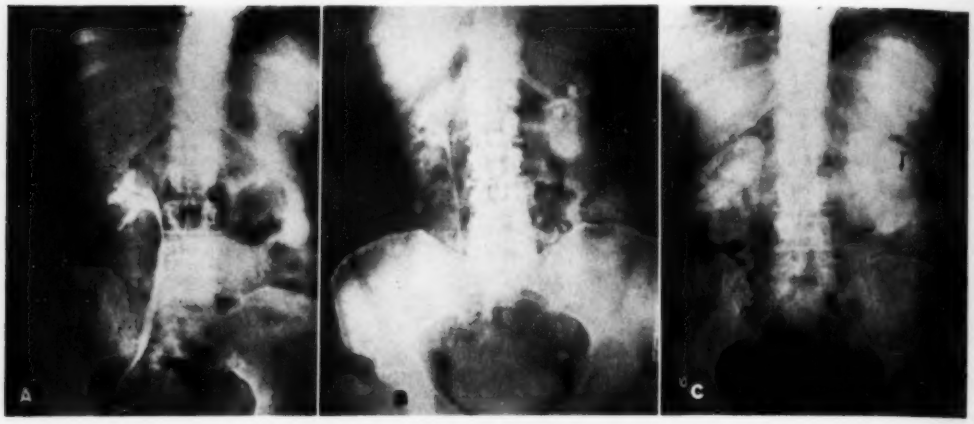

Fig. 4. Case 4. A. Right retrograde pyelogram showing distortion of mid-calyceal group. B. Intravenous pyelogram indicating left renal cyst. C. Nephrogram demonstrating large area of radiolucency in left kidney, thought to represent a cyst. Right kidney opacified homogeneously and normally. Findings verified at operation.

typical renal cyst. Because of the suspicious distortion of the right calyceal structures seen on retrograde pyelography and the definite evidence that bloody urine was emanating from the right ureteral orifice, a right nephrectomy was performed. Gross and microscopic examination of this kidney showed no abnormality. In this instance, the only nephrographic abnormality was related to the left kidney.

CASE 5: *Right Ureteral Calculus.* A 41-year-old female with a known right renal calculus had had repeated attacks of severe right flank pain. She was admitted to the hospital during one of these episodes. Nephrography showed sharply outlined renal shadows with an oval calculus just medial to the lower portion of the right kidney (Fig. 5A). A film of the abdomen exposed fifteen minutes after the injection (Fig. 5B) showed good visualization of the calyceal structures and definitely located the calculus at the right uretero-pelvic junction. Renal opacification was denser on the nephrogram exposed 21 seconds after the injection, at which time a high concentration of contrast substance remained in the renal capillary bed. This case serves to illustrate the combination of nephrography and pyelography in a single examination.

DISCUSSION

The cycle of events associated with nephrography may be considered to consist of three phases: (1) *The arterial phase,* during which contrast substance fills the renal arteries and their branches. This occurs at the time of opacification of the descending aorta (at between ten and fourteen seconds) and merges imperceptibly with the next phase. (2) *The capillary phase* is the period of maximum radiopacification. During this period, which lasts from four to six seconds, contrast substance fills the arterioles and venules of the kidneys and causes a sudden increase in renal density. (3) *The excretory phase* begins during the preceding (capillary) phase and consists of the accumulation of contrast substance in the glomerular tufts and the kidney tubules, followed by its appearance in the calyces. This phase is thought to build up to a maximum level over the course of several minutes, depending upon the functional state of the kidney. It is responsible for the moderate increase in renal opacity not infrequently demonstrable in routine intravenous pyelograms. Renal veins have not proved to be readily identifiable by this technic.

Certain criticisms of the method as presented are apparent from a theoretical point of view. Disease processes resulting in reduced renal blood flow will impair nephrographic visualization, particularly during the first and second phases. Thus it may be anticipated that increase in contrast will be submaximal in the presence of chronic pyelonephritis, grossly diminished renal function, and cardiac decompensation.

In four of the cases in this series, poor opacification was obtained despite apparently normal circulatory and renal function. It is assumed that the exposures

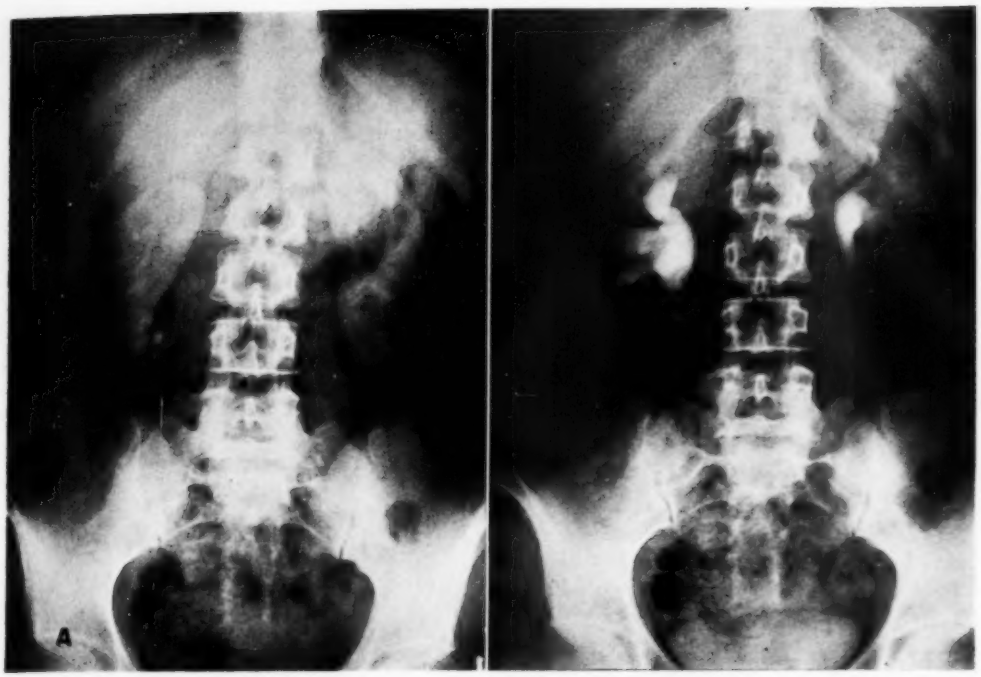

Fig. 5. Case 5. A. Nephrogram, capillary phase at twenty-one seconds, showing normal renal outlines with an oval calculus medial to the lower right kidney. B. Roentgenogram of abdomen fifteen minutes later, showing good pyelographic visualization and locating stone at right uretero-pelvic junction.

were made at inappropriate times, either preceding or following renal capillary filling. This technical problem may be circumvented by the use of a rapid serial method of roentgenographic recording, such as was used by Weens *et al.* (7). We are exploring the application of the Fairchild x-ray roll-film magazine to this problem (9). With this device, it is possible to obtain roentgenograms at half-second (or longer) intervals for a total of over eighty exposures. It is expected that films at one-second or longer intervals during the period from ten to twenty-two seconds following the injection will materially increase the number of satisfactory examinations. In this manner, a complete nephrographic "cycle" may be recorded, thus demonstrating the arterial structure, the opacified renal outline (capillary phase), and the calyceal architecture of the kidneys following a single injection.

It seems logical to assume that nephrography might prove to be of value in the differential diagnosis of renal cysts and carcinoma. Pooling of contrast substance in carcinomatous and sarcomatous lesions of the kidney has been described (2, 3, 6), while renal cysts generally produce areas of radiolucency in the opaque renal silhouette. Although the above generalities have a certain diagnostic value, it would be dangerous to place reliance upon them. Many tumors, such as certain sarcomas, are poorly supplied with blood vessels. Hypernephromas occasionally break down centrally because of inadequate blood supply. Renal carcinoma may occur within otherwise typical benign renal cysts. For these reasons, no space-occupying lesion of the kidney should ever be definitively diagnosed without microscopic examination. Apparent avascularity of a renal lesion might be considered indicative *but not diagnostic* of benign cyst.

SUMMARY

1. A method of nephrography is presented which consists of radiopacification of the renal silhouette by injection of large doses of a concentrated organic iodine-containing contrast substance. In the presence of normal renal blood flow and functioning renal parenchyma, films may be appropriately timed to show the renal arterial supply and the parenchyma. Delayed films show calyceal structures well outlined.

2. The procedure is probably no more hazardous than intravenous pyelography save that the use of more highly concentrated contrast substances increases the incidence of chemical thrombosis of the injected vein. Nephrography as it is herein described does not require general anesthesia, aortic puncture, or ureteral catheterization. The examination is contraindicated in the presence of known sensitivity to the contrast substance employed. Optimal opacification of the renal parenchyma is less often obtained in the presence of seriously impaired renal function, and the procedure may constitute a greater hazard in such patients (10). Nephrography has been employed 25 times by us without significant complications. Increase in contrast of the kidneys was considered satisfactory in 18 instances. The use of rapid serial roentgenography and added experience with the method are expected to demonstrate a wider application in the study of renal lesions.

3. Nephrography is indicated as a supplementary method of examination in certain instances where intravenous and retrograde pyelography are diagnostically inadequate. The failure of the latter methods to demonstrate lesions which are not large enough to cause appreciable distortion of the calyceal structures is well recognized. In affording opacification of normally functioning renal parenchyma, nephrography is of value in the exact delineation of renal form and position. Renal cysts are revealed as discrete areas of non-opacification, while other tumors may be demonstrated as areas of non-opacification or abnormal pooling of contrast substance. Many vascular anomalies should be readily recognized by this technic. Nephrography aids in the delineation of structures superimposed upon the kidney outlines and should be of value in place of or in combination with perirenal air insufflation.

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REFERENCES

1. DOS SANTOS, R., LAMAS, C., AND PEREIRA CALDAS, J.: Arteriografia da aorta e dos vasos abdominais. Med. contemp. **47:** 93–96, March 17, 1929.
2. NELSON, O. A.: Arteriography in Renal and Abdominal Conditions. J. Urol. **53:** 521–533, April 1945.
3. WAGNER, F. B., JR.: Arteriography in Renal Diagnosis. Preliminary Report and Critical Evaluation. J. Urol. **56:** 625–635, December 1946.
4. Personal communication.
5. HELLMER, H.: Nephrography. Acta radiol. **23:** 233–254, 1942.
6. WEENS, H. S., AND FLORENCE, T. J.: Nephrography. Am. J. Roentgenol. **57:** 338–341, March 1947.
7. WEENS, H. S., OLNICK, H. M., JAMES, D. F., AND WARREN, J. V.: Intravenous Aortography and Nephrography. Am. J. Med. **5:** 620, 1948.
8. ROBB, G. P., AND STEINBERG, I.: Visualization of the Chambers of the Heart, the Pulmonary Circulation, and the Great Blood Vessels in Man. A Practical Method. Am. J. Roentgenol. **41:** 1–17, January 1939.
9. DOTTER, C. T., STEINBERG, I., AND TEMPLE, H. L.: Automatic Roentgen-Ray Roll-Film Magazine for Angiocardiography and Cerebral Arteriography. Am. J. Roentgenol. **62:** 355–358, September 1949.
10. PENDERGRASS, E. P., CHAMBERLIN, G. W., GODFREY, E. W., AND BURDICK, E. D.: Survey of Deaths and Unfavorable Sequelae Following Intravenous Administration of Contrast Media. Am. J. Roentgenol. **48:** 741–762, December 1942.

SUMARIO

Nefrografía: Técnica Simplificada

Con el método nefrográfico aquí expuesto inyéctanse en cualquiera vena antecubital accesible grandes cantidades de un medio de contraste que contiene yodo orgánico concentrado y se toman radiografías a plazos apropriados. En presencia de un riego sanguíneo normal en el riñón y de un parénquima renal funcionante, pueden

observarse con el mismo la circulación arterial del riñón y el contorno renal. Las radiografías retardadas demarcan bien los tejidos de los cálices.

Los AA. han empleado este procedimiento en 25 ocasiones sin complicaciones de mayor alcance y con contraste satisfactorio en 18. El examen está contraindicado en enfermos reconocidamente susceptibles al medio empleado y puede constituir un riesgo, además, en presencia de una función renal seriamente afectada.

La nefrografía está indicada como método complementario de examen en ciertos casos en los que la pielografía intravenosa y retrógrada resulta inadecuada para el diagnóstico. Por proporcionar opacificación del parénquima renal que funciona normalmente, el procedimiento resulta útil para la delineación exacta de la forma y posición del riñón. Los quistes renales aparecen en forma de zonas discretas sin oscurecimiento o fusión anómala de la sustancia de contraste. Con esta técnica deben reconocerse fácilmente muchas anomalías vasculares. La nefrografía ayuda a demarcar órganos sobrepuestos a los contornos renales y debe resultar de valor como sustituto de la insuflación perirrenal con aire o en combinación con la misma.

Right Heart Catheterization of Anomalous Pulmonary Veins Emptying into the Right Atrium[1]

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As the result of the numerous developments in cardiovascular surgery that have taken place during the past decade, the need for a precise diagnosis in a patient with congenital heart disease is obvious. In some patients, operable cardiovascular defects can be diagnosed by relatively simple methods (1, 2). In others, additional studies are necessary in order to make a correct diagnosis. These may include determination of circulation time, angiocardiography, heart catheterization, electrokymography, oximeter studies, unipolar lead electrocardiography, etc. During the course of a study in which we have been evaluating these various diagnostic tests in the diagnosis of congenital heart disease, we have discovered by means of right heart catheterization the anomalous insertion of one or more pulmonary veins into the right atrium. This occurred in three patients clinically suspected of having an interatrial septal defect:

Case 1: I. C., a 15-year-old girl, was referred to the University of Minnesota Hospitals by her doctor for evaluation of her heart condition. She was thought to have both acquired and congenital heart disease. When she was three years of age, she was examined because of whooping cough, and the parents were informed at that time that she also had heart disease. At six years of age, she was seen by a cardiologist, who informed the parents that the child had congenital heart disease. She was hospitalized for rheumatic fever for a period of one year at the age of eight, and had a recurrence of that disease when fourteen years of age. At the time of her examination by us, she had minimal cardiac disability. She had no unusual dyspnea, but she complained of occasional bouts of palpitation on exertion.

On physical examination the patient appeared well developed and well nourished. The general examination was negative. Examination of the heart revealed a loud, blowing systolic murmur heard best over the pulmonic area but also over the entire precordium. A diastolic murmur was audible over the mitral area. The blood pressure was 120/70 mm. of mercury in the right arm. The clinical impression was that the patient had Lutembacher's syndrome (interatrial septal defect with mitral stenosis).

Fig. 1. Case I. Cardiac catheter passing through the heart and out into the lung field. A blood sample removed from this area was 99 per cent saturated with oxygen, thus confirming the diagnosis of anomalous pulmonary vein emptying into the right atrium.

An electrocardiogram revealed right axis deviation. Fluoroscopic examination and roentgenograms of the heart showed a small aorta, a markedly enlarged right ventricle, and an increase in the size of the pulmonary artery, root shadows, and vascular markings. The findings were consistent with an interatrial septal defect.

Right heart catheterization was done under local anesthesia. The left median basilic vein was used. A No. 8 ureteral catheter was inserted and advanced into the heart and out into the right pulmonary

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TABLE I: CARDIAC CATHETERIZATION DATA FOR CASE I

Area Tested	Pressure in Millimeters Mercury		Blood Oxygen Values	
	Systolic	Diastolic	Oxygen Content in Volumes Per Cent	Oxygen Saturation: Per Cent
Superior vena cava			13.6	82
Right atrium near tricuspid valve	6	−2	14.1	86
Right atrium, middle part			14.9	91
Right atrium, right wall			14.7	90
Right ventricle apex	26	0	15.0	93
Right ventricle, below pulmonary valve			14.9	91
Right pulmonary artery	20	6	14.0	85
Left pulmonary artery	26	6	14.8	92
Right pulmonary capillary			15.8	98
Right pulmonary vein, far out	14	6	15.9	99
Right pulmonary vein, close in			15.8	96
Femoral artery			16.3	100

Oxygen consumption = 263 c.c. per minute.
Estimated systemic blood flow = 9.8 liters/min.
Estimated pulmonary blood flow = 17.5 liters/min.
Estimated left-to-right shunt = 7.7 liters/min.

artery. The oxygen content of the blood in the pulmonary artery and the various chambers, with the pressures, are given in Table I. After the catheter was withdrawn into the right atrium, attempts were made to advance it into the inferior vena cava; these were unsuccessful. However, the catheter slipped with relative ease laterally into an anomalous pulmonary vein emptying into the border of the right atrium. Blood removed from this area was 99 per cent saturated with oxygen. A roentgenogram made with the catheter in this position is reproduced in Figure 1.

CASE II: R. K., a 16-year-old boy, was first seen at the University Hospitals in July 1948. At that time he complained of easy fatigue of five years duration. When he was three months of age, his mother noticed that he did not seem to be progressing normally in physical development. A local doctor could find nothing to account for the patient's slow growth. His motor development was entirely normal. He was not checked again by a physician until he was ten years of age, at which time the mother again felt that he was undernourished. Again no explanation could be found for the patient's slow growth. He was seen in 1948 at the University Hospitals, and a diagnosis of rheumatic mitral stenosis was made. In going back over the patient's history, however, there was little to support a diagnosis of acute or chronic rheumatic disease. He had had occasional pains in the knees, but these were not associated with swelling, redness, fever, malaise, or epistaxis. He had always been unduly susceptible to upper respiratory infections.

In February 1949, the patient was seen by a different local physician, who did not feel that the boy had rheumatic heart disease but rather congenital heart disease, and he was referred back to the University Hospitals for a more definite diagnosis.

TABLE II: CARDIAC CATHETERIZATION DATA FOR CASE II

Area Tested	Pressure in Millimeters Mercury		Blood Oxygen Values	
	Systolic	Diastolic	Oxygen Content in Volumes Per Cent	Oxygen Saturation: Per Cent
Innominate vein			9.6	61
Right atrium, right wall			13.3	85
Right atrium, near tricuspid valve	6	3	12.7	83
Right ventricle, apex	32	−8	14.4	91
Right pulmonary artery	30	7	12.9	84
Main pulmonary artery			13.1	85
Left pulmonary artery			13.1	86
Right pulmonary vein	14	7	14.3	95
Femoral artery			14.7	94

Oxygen consumption = 193 c.c. per minute.
Estimated systemic blood flow = 3.7 liters/min.
Estimated pulmonary blood flow = 11.1 liters/min.
Estimated left-to-right shunt = 7.4 liters/min.

The patient, now sixteen years of age, was obviously retarded in physical growth. The general examination was negative except for the heart. There was some slight prominence of the left precordium. No thrills were palpable. The P.M.I. was palpable in the sixth left interspace outside the midclavicular line. A systolic murmur was heard over most of the precordium, but best in the second and third left interspaces. P_2 was accentuated and greater than A_2. The femoral arteries were easily palpated. The blood pressure in the right arm was 95/50 mm. of mercury. An electrocardiogram revealed right axis deviation with diphasic T_2 waves. Fluoroscopic examination and roentgenograms of the heart revealed a very small aorta. The right ventricle, pulmonary artery segment, vascular markings, and root shadows were all markedly enlarged. The findings were interpreted as being compatible with an interatrial septal defect.

Heart catheterization was done under local anesthesia. A No. 8 ureteral catheter was easily inserted into the left median basilic vein. The right atrium

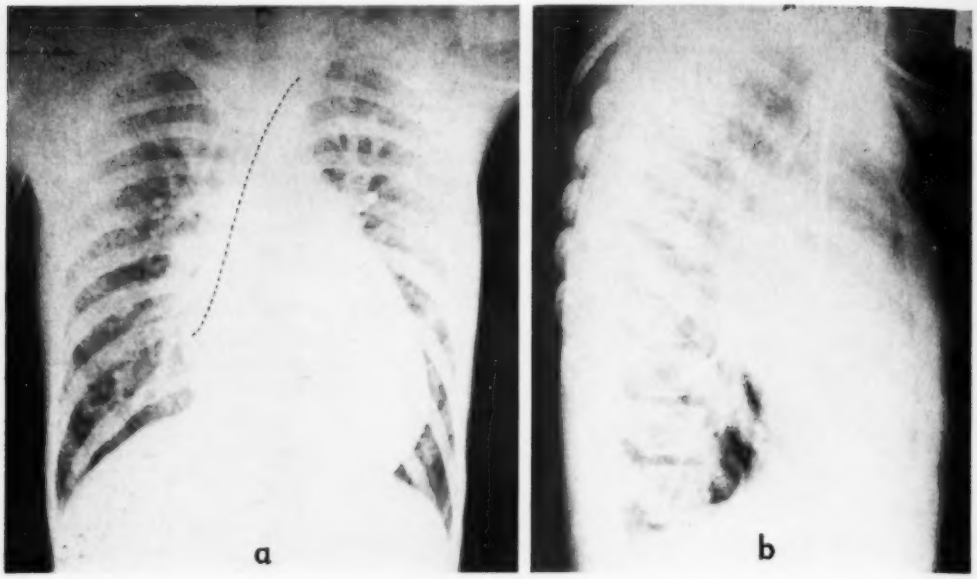

Fig. 2. Case II. *a*. Anteroposterior view of intracardiac course (dotted line) of catheter with its tip just protruding beyond the right heart border in the anomalous vein. Blood removed from this area was 95 per cent saturated with oxygen. Note the enlargement of the right ventricle, pulmonary artery segment, root shadows, and vascular markings. *b*. Right lateral view with catheter in the same position as in *a*, showing its posterior course.

was entered with ease. While an attempt was being made to rotate the catheter, to pass it into the right ventricle, the catheter slipped easily into an anomalous right pulmonary vein. Blood removed from this area was 95 per cent saturated with oxygen. Roentgenograms taken with the catheter in this position are shown in Figure 2. The catheter was withdrawn and advanced out into the right ventricle and into the left pulmonary artery. The values for the oxygen content in the various chambers and the pressures in the same areas are shown in Table II.

CASE III: D. D., an 8-year-old boy, had always been well except for the common contagious diseases. He had never consulted a doctor until February 1948, at which time he was seen because an abnormal cardiac silhouette was discovered in a community chest survey. The mother was informed at that time that the boy had a heart murmur but would probably outgrow it. He was seen again approximately one year later by a different physician, who felt that the murmur was not functional, but rather organic, and referred him to the University Hospitals for evaluation of the exact type of heart disease.

General physical examination was entirely negative. Examination of the heart revealed no thrills. A loud, blowing systolic murmur was heard over the entire precordium but best in the second and third left interspaces. P_2 was greater than A_2 and seemed to be accentuated. The femoral arteries were easily palpated. A resting blood pressure in the right arm was 96/64-58. Following exercise, the blood pressure in the right arm was 106/58-40. An electrocardiogram revealed a normal axis deviation with deep S_1, S_2, and notched R_2 waves.

Fluoroscopic examination and roentgenograms of the heart revealed an enlargement of both the right and left ventricles, prominence of the pulmonary trunk segment, and moderate increase of the pulmonary vascular markings. The aorta was of normal size. These findings were considered consistent with either a patent ductus arteriosus or an interatrial septal defect. Clinically, it was thought that the patient had an interatrial septal defect.

Heart catheterization was done under local anesthesia. A No. 8 ureteral catheter was inserted into the left basilic vein and advanced readily into the right atrium. Here it immediately proceeded to the right lateral border, where it passed out into the lung fields inferiorly and laterally. Blood removed from this area was 98 per cent saturated with oxygen. It was felt that the catheter had passed into an anomalous pulmonary vein emptying into the right atrium. After another sample of blood was removed and the pressure recordings were made, the catheter was withdrawn and advanced into another anomalous vein immediately above the first one, as seen in Figure 3. The catheter was then withdrawn and advanced into the right ventricle and out into the right pulmonary artery. The values for the oxygen determinations of the blood samples removed

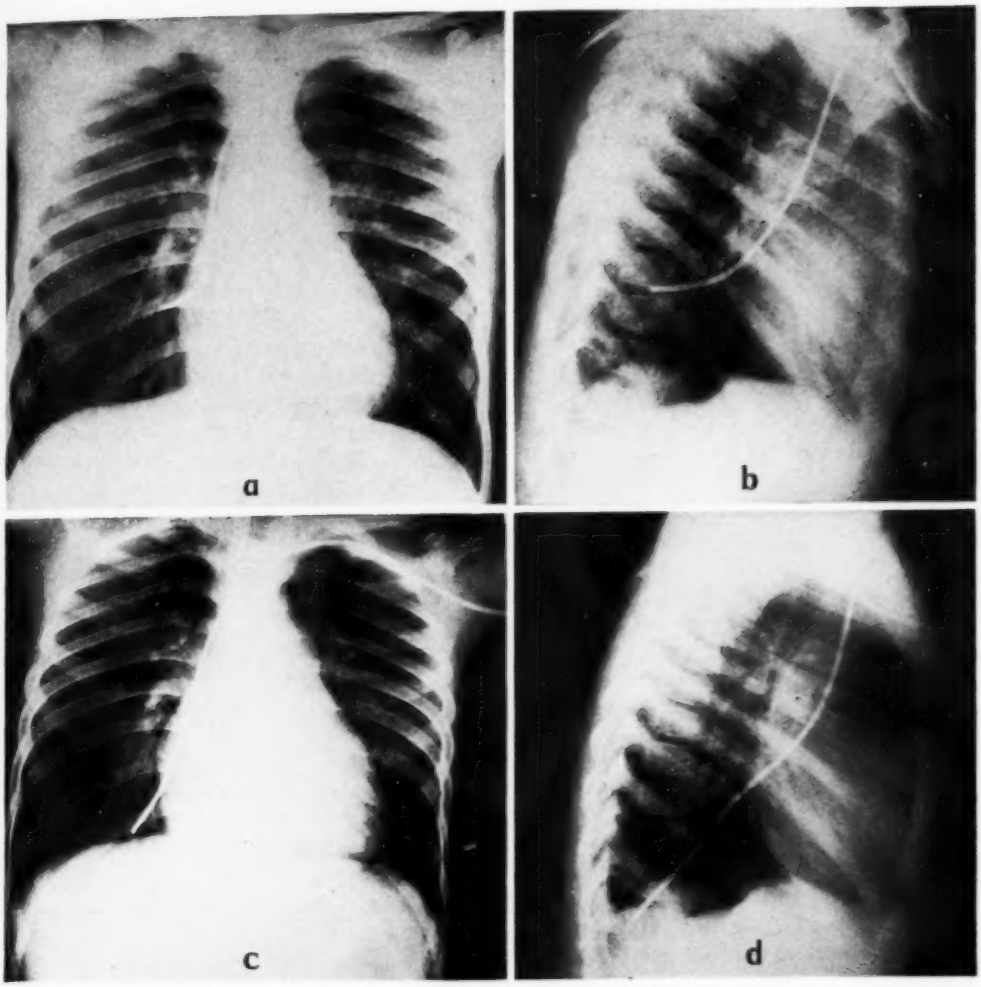

Fig. 3. Case III. Catheter in two different positions in the anomalous vein. *a* and *b* show catheter in upper branch, *c* and *d* show catheter in lower branch of the anomalous vein. Blood removed from both of these areas was 98 to 100 per cent saturated with oxygen. Note the enlarged right ventricle, pulmonary artery segment, and root shadows. *b* and *d* show the posterior course of the catheter.

from the pulmonary artery, right ventricle, right atrium, and innominate vein, as well as the pressures in those areas, are shown in Table III.

DISCUSSION

Both White (3) and Taussig (4) have felt that anomalies of the veins are of little or no clinical importance and have stated that the diagnosis of uncomplicated defects of the great veins has not been made during life. Taussig suggests that the diagnosis could be made by right heart catheterization, but to our knowledge no such instances have been reported. Recently, however, Grishman *et al.* (5) have shown that the diagnosis can be made by angiocardiography and that the anomaly has usually been associated with an interatrial septal defect.

We feel that it is important to know whether the anomalous insertion of the pulmonary veins into the right atrium is complicated by some other intracardiac defect. Theoretically, if the only ab-

TABLE III: CARDIAC CATHETERIZATION DATA FOR CASE III

Area Tested	Pressure in Millimeters Mercury		Blood Oxygen Values	
	Systolic	Diastolic	Oxygen Content in Volumes Per Cent	Oxygen Saturation: Per Cent
Innominate vein			10.7	67
Right atrium, right wall			14.4	93
Right atrium near tricuspid valve	4	3	14.6	92
Right ventricle, apex	21	−2	14.4	91
Right pulmonary artery	12	10	14.1	89
Main pulmonary artery			14.1	89
Lower anomalous pulmonary vein	12	5	15.1	98
Upper anomalous pulmonary vein	12	8	16.3	102
Femoral artery			16.0	100

Oxygen consumption = 283 c.c. per minute.
Estimated systemic blood flow = 5.3 liters/min.
Estimated pulmonary blood flow = 14.9 liters/min.
Estimated left-to-right shunt = 9.6 liters/min.

normality is the anomalous pulmonary vein, it could be ligated surgically, and the increased load placed on the right side of the heart by this anomalous vessel could thus be removed. On the other hand, if some other defect accompanied the anomalous pulmonary vein, ligation of the vein would only partially correct the situation.

In our patients, it is difficult to be certain of the presence or absence of an interatrial septal defect from the oxygen content values of the blood in the various chambers. It is obvious that an increase in the oxygen content of the blood in the right atrium can be due to either a septal defect or an anomalous pulmonary vein emptying into it or both. Since the catheter was not advanced directly through a septal defect, no further statements can be made in this respect.

SUMMARY

In 3 patients with anomalous insertion of the pulmonary vein into the right atrium, the diagnosis was made by right heart catheterization. All 3 were thought clinically to have an interatrial septal defect. The clinical and surgical significance of this lesion is discussed.

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REFERENCES

1. SHAPIRO, M. J.: Diagnosis of Congenital Heart Disease by Ordinary Methods. Radiology **53:** 469–478, October 1949.
2. STAUFFER, H. M.: The Conventional Roentgen Examination in Operable Congenital Heart Disease. Radiology **53:** 488–496, October 1949.
3. WHITE, P. D.: Heart Disease, New York, Macmillan Company, 3d ed., 1944.
4. TAUSSIG, H. B.: Congenital Malformations of the Heart. New York, The Commonwealth Fund, 1947.
5. GRISHMAN, A., POPPEL, M. H., SIMPSON, R. S., AND SUSSMAN, M. L.: Roentgenographic and Angiocardiographic Aspects of (1) Aberrant Insertion of Pulmonary Veins Associated with Interatrial Septal Defect and (2) Congenital Arteriovenous Aneurysm of the Lung. Am. J. Roentgenol. **62:** 500–508, October 1949.

SUMARIO

Cateterismo del Corazón Derecho en Presencia de Venas Pulmonares Anómalas que Desembocan en la Aurícula Derecha

En 3 enfermos con inserción anómala de la vena pulmonar en la aurícula derecha, se hizo el diagnóstico por cateterismo del corazón derecho. En esos casos, parece importante averiguar si la inserción anómala de las venas en la aurícula derecha está complicada por alguna otra deformación intracardíaca. Teóricamente, si la única anormalidad es la de la vena pulmonar, puede ligarse quirúrgicamente, eliminando así la carga extraordinaria impuesta por su presencia al lado derecho del corazón En cambio, si existe algún otro vicio, la ligadura de la vena no haría más que corregir en parte la situación.

En los casos comunicados, se juzgó clínicamente que había una brecha asociada del tabique, pero era difícil cerciorarse de ello, pues no se hizo penetrar el catéter por la misma. El aumento del contenido de oxígeno en la sangre de la aurícula derecha puede deberse ya a la presencia de una vena pulmonar anómala o a un vicio del tabique, o a ambas cosas.

Disseminated Bone Tuberculosis (So-Called Multiple Cystic Tuberculosis)

With Case Report[1]

GILBERT H. ALEXANDER, M.D., and MATTHEW M. MANSUY, M.D.

AN ATTEMPT TO review the literature, in connection with the case of disseminated bone tuberculosis to be described in this communication, showed a voluminous accumulation of papers regarding osteitis tuberculosa multiplex cystoides, based on the original report of Jüngling in 1920. According to Sweet and Abramson (7), the group of cases reported by Jüngling was characterized by the following features: most frequent involvement of the small bones of the hands and feet, a tendency to form cyst-like lesions without reactive changes, a negative tuberculin test, failure to show tubercle bacilli, absence of caseation, frequent coexistence of skin lesions (sarcoid), and spontaneous regression.

The various cases subsequently reported as osteitis tuberculosa multiplex cystoides do not represent a homogeneous group. The designation has been applied to cases with all the criteria of Boeck's sarcoid as well as to those of proved tuberculous etiology. Ellis (1) in 1939 recognized this confusion. He pointed out that Jüngling's disease is osteal sarcoid; that it is pseudocystic in character rather than cystic; and that it is not cystic tuberculosis of bone.

Monfort and Solomon (4) in 1942 reported a case as osteitis tuberculosa multiplex cystoides but called attention to the fact that this disease as seen in children differed in the following respects from Jüngling's cases: there was a greater tendency to involvement of the long hollow bones; associated cutaneous lesions were infrequent; the tuberculin test was usually positive; guinea-pig inoculations sometimes gave positive results; caseation was occasionally seen; there was a tendency for the lesions to heal locally, but frequently the patient died of generalized tuberculosis. They suggested that the disease in children represented an entity which is intermediate between Boeck's sarcoid and caseous tuberculosis of bone.

Most of the cases with bacteriologic proof of a tuberculous etiology have been reported in the pediatric literature, and emphasis has been placed on involvement of the long bones. In contrast, our adult case showed involvement of the axial skeleton. This variance in the distribution of lesions is in accord with the different patterns in adults and children noted and discussed by Nathanson and Cohen (5). These writers reviewed 200 cases of proved bone and joint tuberculosis in 1940. Thirty-five per cent of their pediatric cases and 28 per cent of their adult cases showed involvement of more than one area. In the adult group, no lesions of the metacarpals or phalanges, which are so prominent in Jüngling's disease, were encountered.

It is considered that practically all cases of bone tuberculosis represent hematogenous spread of the organism from its primary port of entry. The cases reported would appear to fall into two broad categories: one group with involvement of only one bone or adjacent bones, and a second group in which there is a more general disseminated spread. The case to be reported would appear to fall within this latter category.

CASE REPORT

A 21-year-old Negro male entered the hospital Nov. 3, 1948, complaining of pain in the cervical and lumbar spine of two months duration and chills and fever for the past three days.

[1] From the Radiological and Medical Services, Veterans Administration Hospital, Aspinwall, Penna., and the University of Pittsburgh School of Medicine. Accepted for publication in March 1950.

Reviewed in the Veterans Administration and published with the approval of the Chief Medical Director. The statements and conclusions published by the authors are the result of their own study and do not necessarily reflect the opinion or policy of the Veterans Administration.

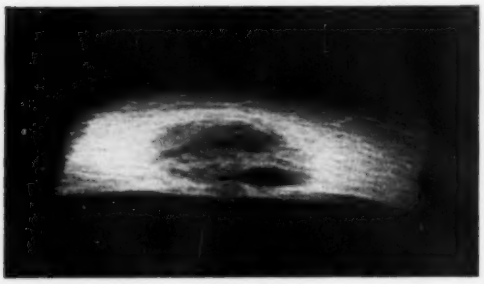

Fig. 1. Roentgenogram of involved segment of 5th left rib, removed at initial biopsy.

At the time of admission the temperature was 103° F. There was tenderness to percussion over the entire spine, with marked limitation of motion in the cervical and lumbar areas. Hematological examination, urinalysis, and the Kahn test were negative.

Roentgen examination showed no pulmonary changes, but local areas of destruction were noted within the 3rd and 6th ribs anteriorly on the right and within the 5th left rib anteriorly. These areas of destruction were somewhat irregular in outline and were not associated with any reactive changes or expansion of the cortex (Fig. 1). Subsequent skeletal survey showed no lesions of the long bones or of the hands. The skull presented several areas of destruction in the vault (Fig. 2A). Two of these had poorly demarcated borders with sequestration. The cervical spine was normal initially, but later anterior subluxation of the 5th cervical vertebra was demonstrable, with narrowing between that vertebra and the 6th (Fig. 3). In addition, there was evidence of bony bridging between the bodies of the vertebrae. There was also evidence of destruction in the left side of the body of the 5th lumbar vertebra and central destruction within the bodies of the 3rd and 4th lumbar vertebrae. Lytic lesions were present in the ala of the left ilium (Figs. 4A and 5A), the 9th right rib posteriorly, the 9th and 10th left ribs near the posterior axillary line, and the left scapula. The roentgenologist suggested that the lesions were probably infectious, possibly tuberculous, but advised that numerous conditions including multiple myeloma, eosinophilic granuloma, gummata, etc., would have to be considered. The urine was repeatedly negative for Bence-Jones protein; it showed a heavy concentration of calcium. The blood chemistry was as follows: calcium 14.0 mg. per 100 c.c.; inorganic phosphorus 3.6 mg. per 100 c.c.; alkaline phosphatase 2.6 Bodansky units; acid phosphatase 1.2 Bodansky units; non-protein nitrogen 31 mg. per 100 c.c.; serum protein 8.8 gm. per 100 c.c., with an albumin-globulin ratio of 1.2:1. The reaction to PPD (1:50,000) was four plus. Twenty sputum examinations were negative for acid-fast bacilli. The sternal marrow findings were normal.

The patient continued to have a febrile course.

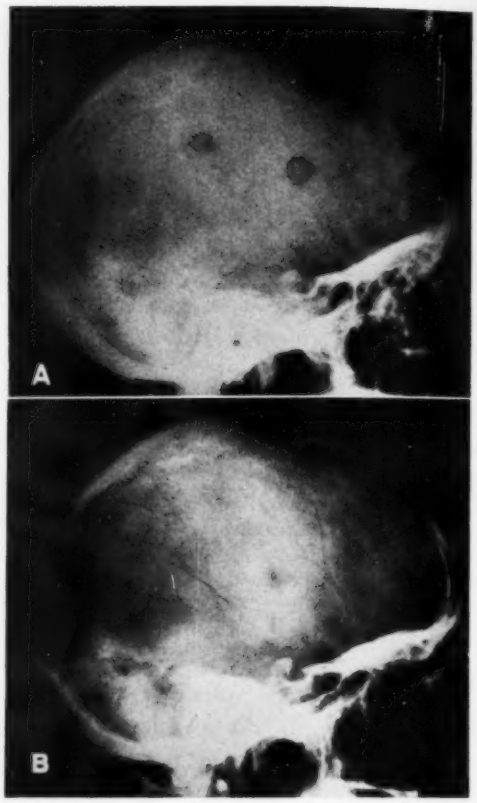

Fig. 2. A. Roentgenogram of skull, Nov. 5, 1948, showing lytic areas in frontal and parietal regions. Note poorly demarcated sequestrum in the lesion immediately posterior to the coronal suture. B. Jan. 8, 1950. Complete healing of all but one of the skull lesions.

Twelve days after admission, a biopsy of the 5th left rib anteriorly was taken. Grossly, the bone showed an area of rarefaction measuring 1.5 cm. Microscopically, no necrosis was seen, but a granulomatous lesion containing Langhans giant cells and numerous eosinophils was defined. There was uncertainty as to whether the lesion represented tuberculosis or eosinophilic granuloma.

One month later, a fluctuant painful area developed over the spinous process of the 4th thoracic vertebra. Roentgen examination showed a bilateral paravertebral mass extending from the 6th to the 9th dorsal vertebra and destruction of the spinous processes of the 4th and 5th dorsal vertebrae. The initial chest film was reviewed and, in retrospect, a smaller paravertebral mass could be defined (Fig. 6).

The abscess over the 4th dorsal vertebra was incised and drained. No sinus tract could be found communicating with the paravertebral mass. A section of the spinous process was taken, and microscopic study showed caseation, marked fibroblastic

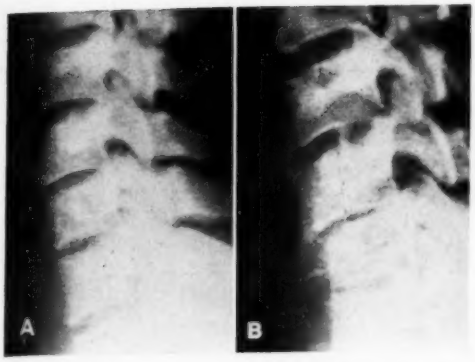

Fig. 3. A. Roentgenogram of cervical spine, Nov. 6, 1948, showing no definite abnormality. B. July 25, 1949. Subluxation, destruction of intervertebral disk, and calcification.

reaction with areas of epithelioid cells, and a few Langhans' type giant cells. The material obtained was positive for tubercle bacilli on culture and guinea pig inoculation. Incision and drainage of the paravertebral abscess and of a retropharyngeal abscess also yielded material positive for tubercle bacilli. Under dihydrostreptomycin therapy there was a ten pound gain in weight but the febrile course persisted and drainage from the paravertebral abscess occurred intermittently. The patient was subsequently transferred to a tuberculosis center. Current x-rays, fourteen months after the onset of the illness, show progressive healing of the skeletal lesions.

DISCUSSION

On the basis of the symptoms and the radiographic features in this case, it is presumed that multiple lesions of the bones of the skull, the cervical spine, the dorsal spine, the lumbar spine, the left ilium, the left scapula, and the various ribs developed simultaneously. We considered the appearance of the skull lesions as the most important feature, suggesting that the whole process visualized at the time of the initial study was tuberculous. The character of the skull lesion has been described by Volkmann (8), Straus (6), and Meng and Wu (3). The paravertebral abscess, though not defined initially, offered further evidence of tuberculosis. The strongly positive tuberculin test also afforded some affirmation. The initial biopsy of a rib was indeterminate, but the second biopsy of the spinous process of the 4th dorsal vertebra afforded histologic and bacteriologic proof of the etiology.

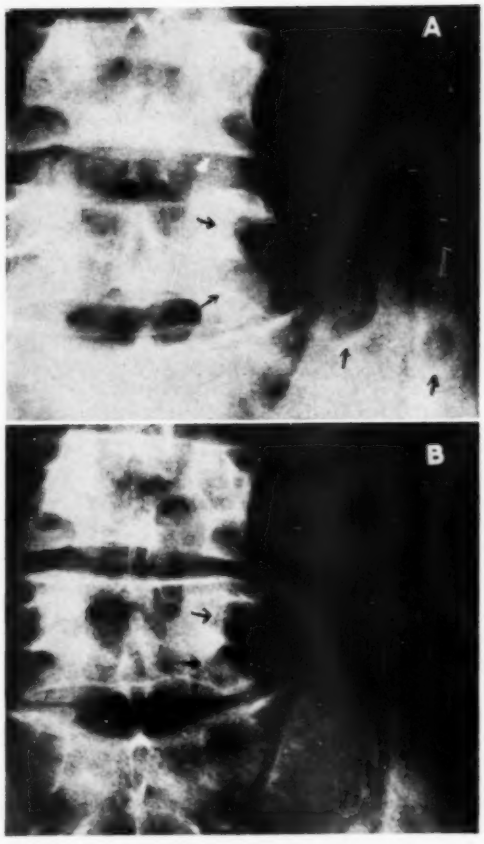

Fig. 4. A. Roentgenogram obtained Nov. 5, 1948, showing lesion of left lateral margin of the 5th lumbar vertebra and lesions of the sacrum and ilium. B. Jan. 8, 1950. Lesions of the sacrum and ilium are healed; the lesion of the 5th lumbar vertebra is sharply demarcated.

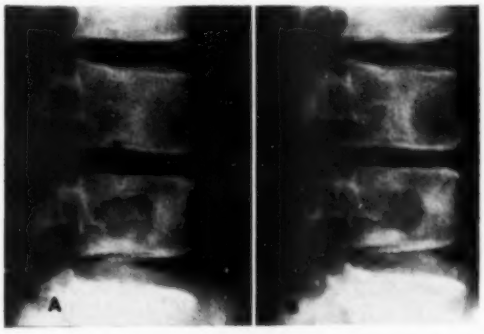

Fig. 5. A. Lateral view of 3rd and 4th lumbar vertebrae, Nov. 5, 1948, showing central location of lesions and lack of involvement of the intervertebral disk. B. March 6, 1949. Increasing calcification.

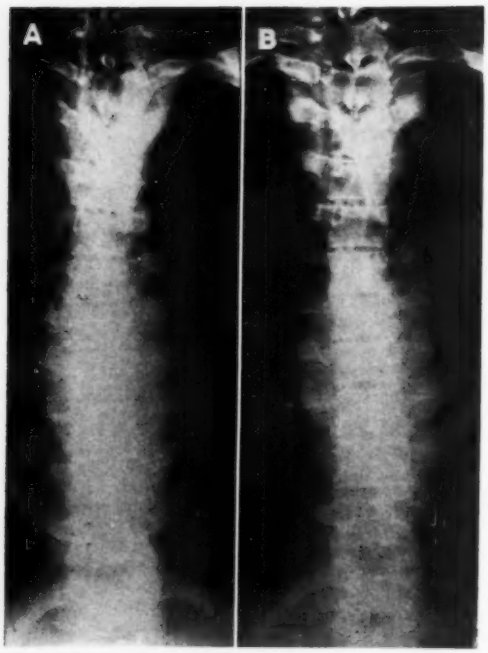

Fig. 6. A. Roentgenogram of thoracic spine, Nov. 5, 1948. Paravertebral abscess may be suggested. B. March 7, 1949. Definite paravertebral abscess; destruction of spinous process of 4th thoracic vertebra

The widespread involvement of the spine would suggest that the various vertebrae were involved simultaneously. Extension along the spinal ligaments would seem to be ruled out since the lesions were central in location and appeared to be of the same age. The rib lesions were not associated with the paravertebral abscess but with separate central areas of destruction elsewhere.

The hypercalcemia and hypercalcuria are regarded as consistent with extensive bony destruction and in no way related to the etiology of the disease. The serum protein was unexplainably high on repeated examination. However, hyperproteinemia has been described as occasionally occurring in tuberculosis (2).

Evidence of complete healing of the scapular and rib lesions was noted coincidentally with dihydrostreptomycin therapy. The skull and spinal lesions also showed some evidence of healing (Fig. 2B, 4B, and 5B), with considerable paravertebral calcification. These observations and the survival of fourteen months, in spite of the wide dissemination of tuberculosis initially present, convince us that the course of the disease was favorably influenced by dihydrostreptomycin therapy.

SUMMARY

1. The term osteitis tuberculosa multiplex cystoides has led to much confusion. It is suggested that the term disseminated bone tuberculosis be substituted for cases of widespread tuberculous bone involvement with or without a cystic appearance.

2. A case of disseminated bone tuberculosis in an adult, with more extensive lesions than have been previously reported, is presented, with a discussion of the diagnostic features.

3. The clinical course after dihydrostreptomycin therapy suggests definite benefit.

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REFERENCES

1. ELLIS, F. A.: Jüngling's "Osteitis Tuberculosa Multiplex Cystoides" Is Not Cystic Tuberculous Osteitis. Acta med. Scandinav. **104:** 221–224, 1940.

2. LOEB, R. F.: Plasma Proteins in Health and Disease. New England J. Med. **224:** 980–987, June 5, 1941.

3. MENG, C. M., AND WU, Y. K.: Tuberculosis of the Flat Bones of the Vault of the Skull. Study of 40 Cases. J. Bone & Joint Surg. **24:** 341–353, April 1942.

4. MONFORT, J. A., AND SOLOMON, N. H.: Osteitis Tuberculosa Multiplex Cystoides in Children. Am. J. Dis. Child. **63:** 346–353, February 1942.

5. NATHANSON, L., AND COHEN, W.: Statistical and Roentgenological Analysis of Two Hundred Cases of Bone and Joint Tuberculosis. Radiology **36:** 550–567, May 1941.

6. STRAUS, D. C.: Tuberculosis of the Flat Bones of the Vault of the Skull. Surg., Gynec. & Obst. **57:** 384–398, September 1933.

7. SWEET, L. K., AND ABRAMSON, D. J.: Multiple Cystic Tuberculosis of the Long Bones. J. Pediat. **19:** 826–832, December 1941.

8. VOLKMANN, R.: Die perforierende Tuberkulose der Knochen des Schädeldaches. Centralbl. f. Chir. **7:** 3–7, 1880. Quoted by Straus (6).

SUMARIO

Tuberculosis Osea Diseminada (la llamada Tuberculosis Quística Múltiple), con Historia Clínica

El término de osteítis tuberculosa multiplex cystoides ha dado origen a mucha confusión, por lo cual se propone, como sustituto, el empleo del término de tuberculosis ósea diseminada para designar todos los casos de invasión ósea tuberculosa generalizada, con y sin aspecto quístico.

El caso de tuberculosis ósea diseminada aquí communicado en un adulto tenía lesiones más extensas que las descritas antes de ahora. Roentgenológicamente, pudieron observarse zonas localizadas de destrucción en varias costillas de ambos lados, la bóveda craneal, porciones cervical, dorsal y lumbar del raquis, el hueso coxal izquierdo y el omoplato izquierdo. Además, se formó un absceso paravertebral. La reacción a la tuberculina resultó fuertemente positiva, y la biopsia de una de las lesiones vertebrales aportó pruebas histológicas y bacterianas de la etiología.

La dihidroestreptomicinoterapia fué seguida de signos roentgenológicos de cicatrización de algunas de las lesiones óseas.

Primary Hepatoma with Metastasis to a Long Bone[1]

D. S. CARNAHAN, JR., M.D.

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PRIMARY CARCINOMA of the liver occurs in two forms: one arising from the liver cells (hepatoma) and the other from the intrahepatic bile ducts. These types occur in a ratio of 92 to 8, respectively (14). Primary hepatoma rarely metastasizes to bone, and among those cases where such metastasis does occur, involvement of a long bone is an extreme rarity.

The incidence of bone metastases in carcinoma of the liver, as reported in the literature, varies. Charache (5) found it to be 1.6 per cent in 1,125 cases. Greene (6), in a ten-year collective review, found that of 386 proved cases, 8 per cent had metastasized to bone. The figure of Hoyne and Kernohan (7) is intermediate between these two. In a series of 31 hepatomas among 16,303 autopsies, they discovered bone metastasis but once, an incidence of 3.22 per cent.

Making every effort not to duplicate cases, the present writer found in the literature a total of 1,380 cases of hepatoma (1–4, 8–10, 12–14). To these he is adding 11 derived from 3,324 autopsies done at St. Vincent's Hospital, bringing the total number of cases to 1,391. Of this total, 45 (3.23 per cent) have shown long-bone involvement. The purpose of this paper is to report one such case.

CASE REPORT

J. C., a 60-year-old white male of Hungarian nativity, was brought to St. Vincent's Hospital on March 2, 1948, after having fallen on a stairway. He was found to have a spiral comminuted fracture involving the proximal shaft of the right humerus. He gave a history of having been treated for hypertension and diabetes. The only physical findings of note, in addition to the fracture, were an apical systolic murmur and a blood pressure of 190/110. The fracture was treated by the insertion of a Kirschner wire through the olecranon process and the application of skeletal traction.

On March 18, 1948, the roentgenologist reported the presence of a destructive lesion in association with the fracture. The Kirschner wire was removed and a hanging cast applied. The patient was then permitted to leave the hospital for three days. He was readmitted on April 6, 1948, for further study. Clinically there was no change in the appearance of the arm. The diabetes was well controlled. The serum calcium and acid and alkaline phosphatase determinations were normal.

The patient was discharged to the Fracture Clinic on April 13. While he was attending the clinic, a spontaneous fracture was seen to have occurred proximal to the original fracture site. A mass measuring about 2 × 3 cm. was discovered in the left supraclavicular region.

On readmission to the hospital, May 14, 1948, physical examination yielded no new findings other than the mass in the neck and a moderate degree of pretibial edema. One examiner believed the liver to be slightly enlarged, but this was not borne out by others. Aspiration biopsy of the neck mass led to a diagnosis of "thyroid adenoma." At his request, the patient was discharged on June 2.

Pain in the arm, as well as limitation of motion, now developed. The so-called aberrant thyroid continued to enlarge, and the patient was readmitted on July 20, 1948. The mass was removed, and the pathologist reported as follows: "True adenoma of thyroid. However, it is difficult to rule out carcinoma."

Examination on Sept. 10 revealed the liver edge to be palpable 7 cm. below the right costal margin. This was interpreted as due to metastatic involvement from the primary source in the aberrant thyroid. Biopsy of the lesion of the humerus revealed only "dense fibrous tissue with bone spicules." On Oct. 19 the patient was referred for roentgen therapy to the arm. Over a period of thirty-three days he received a total of 1,600 r (in air) to each of two 10 × 15-cm. fields, one anterior and one lateral. The irradiation factors were: 200 kv., filtration 1.0 mm. Cu and 1.0 mm. Al, half-value layer 1.5 mm. Cu. target-skin distance 50 cm. Meanwhile repeated roentgenographic examinations of the various systems were carried out. The only positive finding was extrinsic pressure from the enlarged liver upon various segments of the gastro-intestinal tract. Except for moderate relief of pain, the effect of roentgen therapy was not notable.

The patient was again admitted on Dec. 16, 1948,

[1] From the Department of Radiology of St. Vincent's Hospital of the City of New York. Accepted for publication in May 1950.

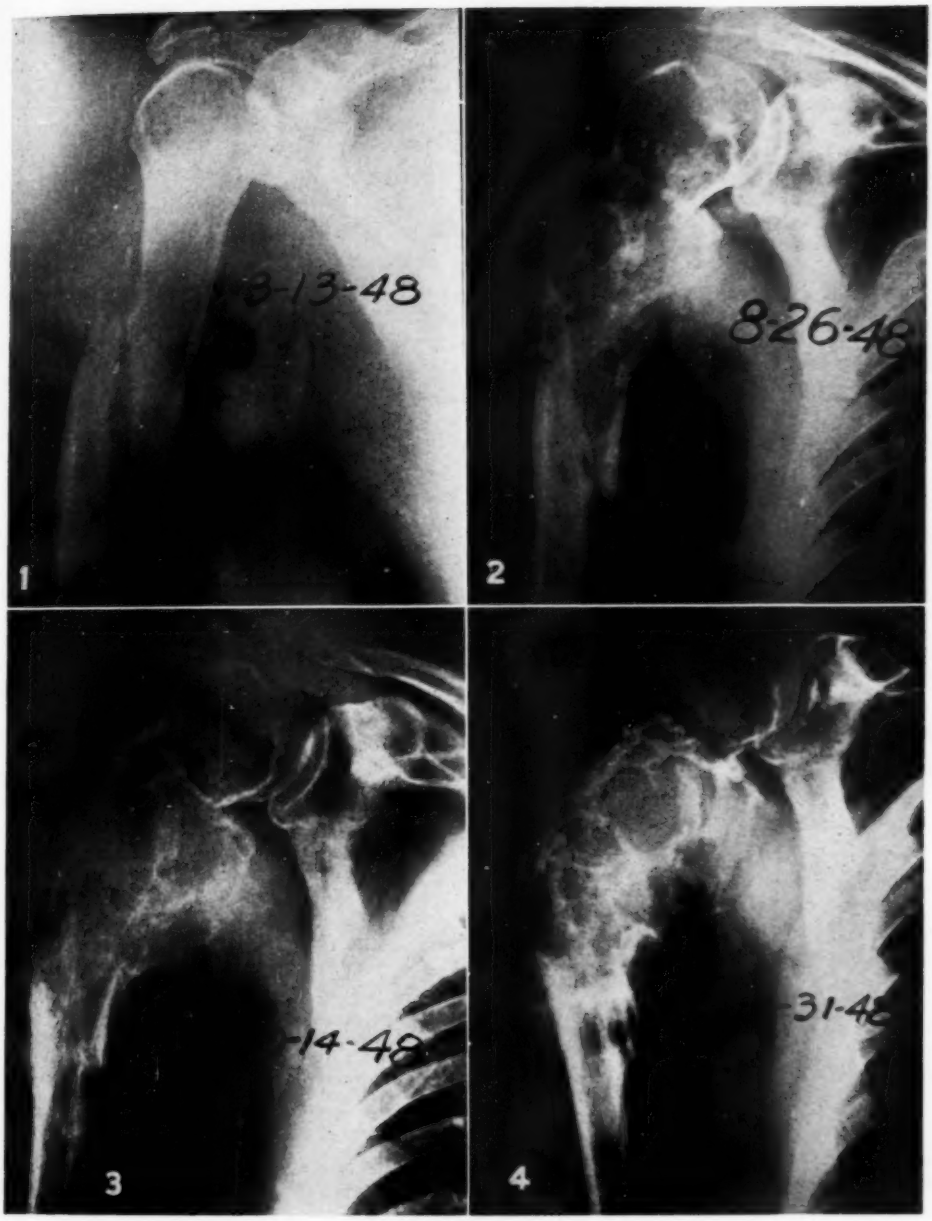

Fig. 1. Examination made on March 13, 1948, eleven days following injury. At the most proximal part of the fracture line are several small areas of bone destruction.

Fig. 2. Examination made on Aug. 26, 1948. The trabeculated appearance of the tumor is now becoming apparent. The residuum of a second fracture is faintly discernible proximal to the original fracture site.

Fig. 3. Examination made on Oct. 14, 1948, showing increasing trabeculation and bulkiness.

Fig. 4. Examination made Dec. 31, 1948, two months prior to the death of the patient. Pain was a very prominent feature at this time.

complaining that he had been "seeing double" for the preceding four days. Electroencephalography, cerebral arteriography, and ventriculography revealed no abnormality. A second biopsy of the lesion in the humerus resulted in a microscopic diagnosis of "metastatic carcinoma." The diplopia improved somewhat, and the patient was again discharged. No etiology was assigned.

The final admission was on Feb. 27, 1949. Marked anasarca had developed, and the subsequent course was rapidly retrogressive. Death occurred on March 5. The essential findings at postmortem examination were carcinoma (hepatoma) of the liver with metastases to bone and brain (suprasellar region), mild dilatation and hypertrophy of the left ventricle, pulmonary emphysema, cirrhosis of the liver, cholelithiasis, and choledocholithiasis.

DISCUSSION

At the time of the autopsy the clinical diagnosis was recorded as adenocarcinoma of aberrant thyroid with metastases in the liver and right humerus. The possibility of a primary carcinoma of the liver had not been entertained. Following the autopsy, all of the previous biopsy sections were reviewed by the pathologist (Dr. Anthony Rottino), who then felt that the so-called aberrant thyroid in reality represented a supraclavicular lymph node which had been completely replaced by neoplastic tissue from the metastasizing hepatoma. The type and arrangement of the cells seen in the node compared favorably with those seen in the primary tumor. This was also true of the second biopsy taken from the lesion in the humerus.

A review of the many films of the humerus obtained during the course of the disease was then undertaken by the various members of the radiology staff. It was found that in the examination made at the time of the original fracture the neoplastic lesion was visible but had not been recognized. It appeared as several small patchy areas of destruction at the extreme proximal part of the fracture line. No periosteal proliferation was seen. At the next examination, ten days later, the lesion was noted and reported. Its essential appearance remained unchanged, except that the lytic areas were slightly larger. However, as the true architecture of the tumor developed, it had one outstanding characteristic, that of relatively large areas of lysis separated by moderately thick septa of dense bone. The septa usually appeared arcuate. This same pattern has been described by Sherman and Pearson (11) in relation to metastasis of renal carcinoma. The similarity of structure suggests that this septate configuration is an expression of the essentially alveolar structure assumed by many tumors of these two types. The tumor was quite bulky. Periosteal proliferation was never a prominent feature except at the immediate fracture sites, where callus formation was rather marked.

SUMMARY

The literature is reviewed with respect to bony metastases arising from primary hepatoma. Eleven more cases are added, one of which involved a long bone. This case is reported, along with a discussion and reproductions showing the roentgenographic appearance of the metastasis. Primary hepatoma must be included in the differential diagnosis of metastatic bone lesions.

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REFERENCES

1. BOLKER, H., JACOBI, M., AND KOVEN, M. T.: Primary Carcinoma of Liver with Bone Metastases. Ann. Int. Med. **10:** 1212–1221, February 1937.
2. Cabot Case No. 24302. Hepatoma of Liver with Metastases to Lungs and Skeleton. New England J. Med. **219:** 133–135, July 28, 1938.
3. Cabot Case No. 27362. Portal Cirrhosis of Liver. Hepatoma with Metastases to Lungs, Bone Marrow and Adrenal. New England J. Med. **225:** 386–388, Sept. 4, 1941.
4. Cabot Case No. 31232. Hepatoma of Liver, with Metastases to Lungs, Adrenal Glands and Vertebras. New England J. Med. **232:** 682–684, June 7, 1945.
5. CHARACHE, H.: Primary Carcinoma of the Liver. Report of Case and Review of the Literature. Am. J. Surg. **43:** 96–105, January 1939.
6. GREENE, J. M.: Primary Carcinoma of Liver. Ten Year Collective Review. Internat. Abstr. Surg. **69:** 231–236, 1939. In Surg., Gynec. & Obst., September 1939.
7. HOYNE, R. M., AND KERNOHAN, J. W.: Primary Carcinoma of the Liver. Study of 31 Cases. Arch. Int. Med. **79:** 532–554, May 1947.
8. LOESCH, J.: Primary Carcinoma of the Liver Arch. Path. **28:** 223–235, August 1939.
9. MENSH, M., AND HANNO, H. A.: Hepatoma of Liver with Metastasis to Bone Occurring in a Patient Known to Have Had Advanced Cirrhosis Eight Years Previously. Gastroenterology **3:** 206–213, September 1944.

10. NEUMANN, M. A.: Primary Carcinoma of Liver with Metastases to Bone. Report of Case. Am. J. Path. **20:** 895–909, September 1944.
11. SHERMAN, R. S., AND PEARSON, T. A.: Roentgenographic Appearance of Renal Cancer Metastasis in Bone. Cancer **1:** 276–285, July 1948.
12. STRONG, G. F., AND MCPHEE, J. G.: Primary Carcinoma of the Liver—Twenty-five Year Study. Ann. Int. Med. **30:** 791–798, April 1949.
13. WEBB, A. C.: Primary Carcinoma of the Liver. Arch. Path. **40:** 382–386, November-December 1945.
14. WILBUR, D. L., WOOD, D. A., AND WILLETT, F. M.: Primary Carcinoma of the Liver. Ann. Int. Med. **20:** 453–485, March 1944.

SUMARIO

Hepatoma Primario con Metástasis en Hueso Largo

A un total de 1,380 casos de hepatoma, con metástasis óseas, recopilados de la literatura, agrega el A. 11 procedentes de 3,324 autopsias consecutivas ejecutadas en el Hospital de St. Vincent, de Nueva York. Del total global de 1,391 casos, 45 (3.23 por ciento) revelaron invasión de los huesos largos. Uno de los casos del A. pertenecía a este grupo, y aparece aquí descrito. La lesión metastática quedaba en el húmero derecho, caracterizándose por zonas relativamente grandes de osteolisis, separadas por tabiques moderadamente gruesos de hueso compacto, por lo general arqueados.

Señálase que hay que tomar en cuenta el hepatoma primario en el diagnóstico diferencial de las metástasis óseas.

Radiation-Induced Squamous-Cell Metaplasia and Hyperplasia of the Normal Mucous Glands of the Oral Cavity[1]

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IN A STUDY OF RADIATION effects on squamous-cell carcinoma of the oral cavity, changes were observed in the adjacent normal mucosal glands. Under the influence of irradiation, the epithelium of these glands frequently underwent squamous metaplasia; less often, the metaplastic epithelium became hyperplastic. This process usually occurred in association with varying degrees of atrophy and fibrosis of the glands together with a chronic inflammatory reaction.

The material studied was from 64 patients with squamous-cell carcinoma of the mouth and oropharynx, in whom biopsy was done before, during, and following irradiation. The number of biopsy specimens ranged from three to nine per patient, the average being six. In 40 cases the initial specimens included, in addition to the carcinomatous tissue, adjacent normal mucosal glands. Progressive metaplastic changes of the glandular epithelium to stratified squamous epithelium were observed in specimens from 23 patients.

The irradiation procedures have been described in detail previously (1). The dose of radiation delivered to the tissues containing the mucous glands was as follows: The average daily tissue dose was from 225 to 275 r. The total dose was approximately 6,000 to 6,500 r, delivered over a period of twenty-three to twenty-eight days. The irradiation factors were: 200 kv.; 0.5 mm. copper and 1.0 mm. aluminum filtration; half-value layer 1.0 mm. copper.

OBSERVATIONS

The histologic changes to be described varied from case to case both in degree and time of onset. Figures 1 to 4 are from a case with a marked degree of metaplasia and hyperplasia. The processes illustrated are much more extensive than in the average case. This patient had an undifferentiated squamous-cell carcinoma of the soft plate and uvula. In the biopsy before treatment (Fig. 1), there is seen adjacent to the tumor a distorted lobule of mucous glands, revealing a mild chronic inflammatory reaction. Several of the acini contain inspissated mucous material.

On the twenty-first day, a few glandular acini are dilated and the cells so distended with mucus as to have burst, spilling their contents into and completely filling the lumen. In many other acini, the cells are non-secretory and the cytoplasm takes an intense acidophilic stain. The nuclei of these cells are pyknotic. The latter process probably represents early atrophy and degeneration of acinar cells rather than normal non-secreting cells. A similar process is observed on the twenty-eighth day (Fig. 2). In a single acinus hypersecreting cells can be seen adjacent to atrophying cells.

On the thirty-fifth day, one week after completion of treatment, the process of squamous metaplasia is much further advanced (Fig. 3). In one lobule of mucous glands can be seen all stages of the process. The basal layer, which normally consists of a single layer of cells so flattened as to be barely perceptible, has now become prominent. It seems probable that the metaplastic stratified squamous epithelium has been derived from the basal layer of cells. As this epithelium proliferates, it encroaches upon the mucus-secreting cells and probably contributes to their eventual disappearance. In one

[1] From the Departments of Radiology and Pathology, New York University-Bellevue Medical Center. Accepted for publication in April 1950.

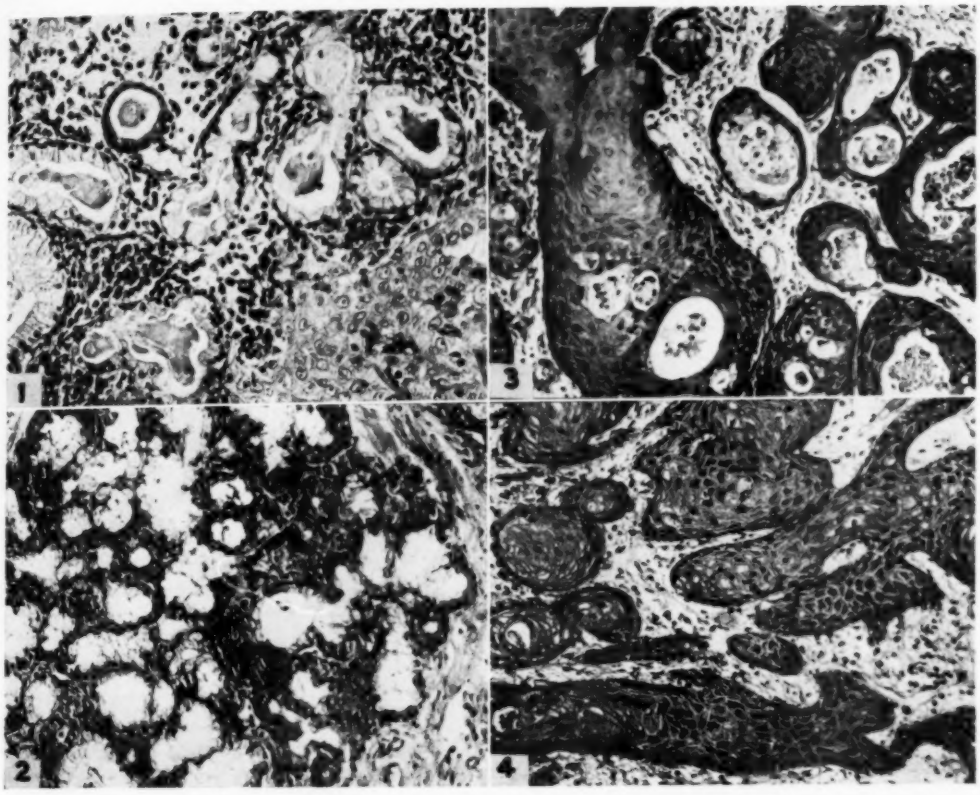

Fig. 1. Undifferentiated squamous-cell carcinoma of the soft palate, radiosensitive. Biopsy before treatment. Normal mucous glands adjacent to tumor. Some of the glands contain inspissated mucus. Moderate lymphocytic infiltration of the stroma. × *c.*125.

Fig. 2. Biopsy taken on last day of treatment (twenty-eighth day). Tissue dose was 6,000 r. Early effect of irradiation on mucous glands. In some, the secreting cells are over-distended with mucus. In others the cells are shrunken and deeply stained. The latter probably represent early atrophy. × *c.*125

Fig. 3. Biopsy from soft palate one week after completion of treatment (thirty-fifth day). There are varying degrees of metaplasia. In the center is an acinus showing early metaplasia arising from the basal layer of cells. The inner secreting layer is beginning to disintegrate. On the left is advanced metaplasia going on to hyperplasia. Early keratinization and intercellular bridges can be seen. × *c.*125

Fig. 4. Biopsy taken on the forty-second day. The mucous-gland architecture has been obliterated by the squamous-cell metaplasia, with marked hyperplasia of the metaplastic epithelium. This process might be misinterpreted as well differentiated squamous-cell carcinoma. × *c.*125.

acinus the metaplastic epithelium shows early hyperplasia.

On the forty-second day, at a time when the tumor was completely destroyed by irradiation, biopsy material obtained from a region somewhat distant from the tumor site reveals extensive hyperplasia of the metaplastic epithelium (Fig. 4). In adjacent lobules, however, the process is much less advanced, and only early metaplasia is seen in a few acini.

Characteristic of the process of radiation-induced squamous-cell metaplasia and hyperplasia of mucous-gland epithelium are its irregularity in degree and inconstancy in time of appearance. Metaplasia occurred in only 23 of 40 patients whose biopsy specimens contained mucous glands. In most instances the process was mild; rarely was it marked (Fig. 4). In a single biopsy specimen containing several lobules of glandular tissue it was not unusual to find all degrees of metaplasia.

The time sequence of metaplasia varied widely in this group of cases. In 4 cases early metaplasia was seen in the biopsy material obtained before treatment; in 10 cases, it began in the first or second week. In 9 cases it began in the third or fourth week. It was most frequently encountered and most extensive by the fifth and sixth weeks.

Metaplasia was observed in the ducts as well as in the acini, and with almost equal frequency. In some cases it occurred predominantly in the ducts; in others in the acini. Usually the extent of metaplasia in the acini was much greater than in the ducts.

DISCUSSION

In radiation-induced metaplasia of the mucous glands of the oral cavity, the sequence of events is: hypersecretion, inspissation of secretion, atrophy of acinar cells with decrease of number of acini, accompanied by replacement fibrosis; proliferation of cells of the basal layers; finally various stages of squamous metaplasia, and on rare occasions hyperplasia of the metaplastic epithelium.

When the mouth or pharynx of a patient is being irradiated, hypersecretion of mucous glands is manifested clinically by the increased production of mucus. This causes considerable discomfort during the early phase of a course of irradiation. Inspissation is manifested clinically, in the later stage and after completion of irradiation, by the production of thick adherent mucus that also causes discomfort.

We believe that the basal layer of cells of the acini is probably the source of the metaplastic epithelium. In the normal thin basal layer it is difficult to distinguish any cell outline, though a few elongated flat nuclei can be easily seen; occasionally this basal layer is not discernible in histologic preparations. Under the influence of irradiation the individual cells become enlarged and distinct; they proliferate and assume a squamous appearance. The proliferation of the cells in a single acinus is usually eccentric, being more marked on one side of the acinus than elsewhere. When these cells begin proliferating, they assume the appearance of stratified squamous epithelium (Fig. 3), and the mucus-secreting cells are displaced toward the lumen; they atrophy, desquamate, and disappear.

Rarely, the stimulus to proliferation is so marked that the islands of metaplastic squamous cells become hyperplastic and then present a picture that may be misinterpreted as a well differentiated, infiltrating squamous-cell carcinoma.

The question arises as to whether the metaplasia was induced by chronic inflammation or irradiation. Of the 40 squamous-cell carcinomas all were infected. In only 4 cases, however, was metaplasia observed prior to irradiation, and in these instances the metaplasia was mild in degree and extent, and confined to the superficial lobules where the inflammation was most marked. Metaplasia was observed after irradiation in 23 cases; it was more marked and involved a much larger percentage of ducts and acini. The process was often found in the deeper lobules that showed little or no inflammation. It seems unlikely, therefore, that inflammation alone could account for the metaplastic changes observed. In the majority of instances, following irradiation, metaplasia was preceded by partial atrophy and fibrosis of the gland lobules together with a mild chronic inflammatory reaction. These changes are presumably due to the early effect of the irradiation.

Radiation-induced metaplasia of mucous-gland epithelium of the oral cavity represents another instance of a biologic process produced by irradiation. The other phenomena, such as radiation-induced osteogenic sarcoma (2–5), carcinoma arising in chronic radiodermatitis (5), and leukemia and ovarian tumors in mice occurring after whole body irradiation (6–8), develop a relatively long time after irradiation is completed. These processes are neoplastic, whereas the process described above is a mildly proliferative one and, in our opinion, not precancerous. In none

of the patients did a cancer occur whose origin could be related to the metaplasia.

CONCLUSIONS

1. Irradiation of the normal mucous glands of the oral cavity incidental to radiotherapy for squamous-cell carcinoma of the mouth and oropharynx, in a series of 64 cases, frequently produced squamous metaplasia of the glandular epithelium.

2. This metaplastic change, probably involving the cells of the basal layer of the ducts and acini, varied considerably in degree and time of onset.

3. Occasionally the metaplastic squamous epithelial overgrowth was so marked as to simulate a well differentiated squamous-cell carcinoma. However, in the authors' opinion there is no evidence that it constituted a precancerous lesion.

4. This is another instance of a proliferative change in normal tissue induced by irradiation.

REFERENCES

1. HALL, J. W., AND FRIEDMAN, M.: Histologic Changes in Squamous-Cell Carcinoma of the Mouth and Oropharynx Produced by Fractionated External Roentgen Irradiation. Radiology **50:** 318–349, March 1948.

2. MARTLAND, H. S.: Occurrence of Malignancy in Radioactive Persons. Am. J. Cancer **15:** 2435–2516, October 1931.

3. SABIN, F. R., DOAN, C. A., AND FORKNER, C. E.: Production of Osteogenic Sarcomata and the Effects on Lymph Nodes and Bone Marrow of Intravenous Injections of Radium Chloride and Mesothorium in Rabbits. J. Exper. Med. **56:** 267–289, August 1932.

4. CAHAN, W. G., WOODARD, H. Q., HIGGINBOTHAM, N. L., STEWART, F. W., AND COLEY, B. L.: Sarcoma Arising in Irradiated Bone. Report of 11 Cases. Cancer **1:** 3–29, May 1948.

5. MACKEE, G. M.: X-Rays and Radium in the Treatment of Diseases of the Skin. Philadelphia, Lea and Febiger, 3d ed., 1938, p. 300.

6. HENSHAW, P. S.: Leukemia in Mice Following Exposure to X-Rays. Radiology **43:** 279–285, September 1944.

7. FURTH, J., AND FURTH, O. B.: Neoplastic Diseases Produced in Mice by General Irradiation with X-Rays. Am. J. Cancer **28:** 54–65, September 1936.

8. LICK, L., KIRSCHBAUM, A., AND MIXER, H.: Mechanism of Induction of Ovarian Tumors by X-Rays. Cancer Reeearch **9:** 532–539, September 1949.

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SUMARIO

Metaplasis Escamocelular e Hiperplasia de las Glándulas Mucosas Normales de la Cavidad Bucal, Evocadas por la Irradiación

La irradiación de las glándulas mucíparas normales de la cavidad bucal, incidente a la radioterapia por carcinoma escamocelular de la boca y la orofaringe, produjo frecuentemente, en una serie de 64 casos, metaplasis escamosa del epitelio glandular.

Esta alteración metaplásica, que probablemente afectaba las células de la capa basal de los conductos y los acini, varió considerablemente en su intensidad y momento de iniciación. De vez en cuando la hipertrofia metaplásica era tan exagerada que simulaba carcinoma escamocelular bien diferenciado. No obstante, opinan los AA. que no hay pruebas de que constituya una lesión precancerosa.

Esto representa otro ejemplo de alteración proliferante inducida por la irradiación en tejido normal.

Intraventricular Glioblastoma Multiforme with the Pneumographic Characteristics of Intraventricular Epidermoids[1]

A Case Report with a Critical Analysis

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In 1936, KRIEG (5) IN GERMANY first described the pneumographic appearance of intraventricular epidermoids, reporting two cases. The following year, Dyke and Davidoff (1) in America independently reported a similar case. The original communications were brief and factual. They merely recorded the findings and suggested that these data might prove helpful in the diagnosis of future cases. The encephalograms published by Dyke and Davidoff showed numerous bizarre globular and linear collections of air in the region of the island of Reil, the right temporal lobe, and the posterior parts of the frontal lobes. This unusual configuration was thought to be due to the collection of air between folds of the tumor surface.

Subsequently, a number of isolated case reports appeared in the literature, describing similar pneumographic findings (2, 3, 4, 6). More recently, a few papers (3, 4) have been published implying that this picture is characteristic and pathognomonic of intraventricular epidermoid tumors. An analysis of the gross pathological findings and the pneumograms suggested that the latter claim was probably too pretentious. It seemed more likely that any large, bulky intraventricular tumor with an irregular surface could produce an identical roentgen pattern. A short time thereafter the opportunity to prove this hypothesis presented itself in the form of a patient with a large intraventricular glioblastoma multiforme.

CASE REPORT

C. O. B., a 69-year-old white female, was admitted to the hospital on Oct. 26, 1948, because of stupor of two to three weeks duration. A month prior to admission, headache had developed, alternately frontal, occipital, and at the vertex. Two weeks later, she became confused, and shortly thereafter began to lose the trend of her speech. On one occasion she stated that she was able to see only half of a long word. Within two or three days, she became progressively more difficult to arouse and complained of tenderness at the vertex. Her expression became dull and she could speak only single words. However, she would brighten up occasionally when her name was mentioned.

The significant physical findings were a two-plus bilateral papilledema with venous engorgement, hypersensitivity to painful stimuli in all extremities, decreased hand grip on the right, positive abdominal reflexes, and hyperactive bilateral equal patellar and Achilles reflexes. Station, gait, co-ordination and fine sensitivity could not be tested. The clinical impression was left frontal-lobe tumor with possible deep extension.

Routine roentgenograms of the skull showed decalcification of the dorsum sella. On Oct. 27, a ventriculogram was obtained. The right lateral ventricle was tapped and 60 c.c. of slightly xanthochromic fluid were removed. The left ventricle was then tapped, but no fluid could be obtained after the initial drop. Examination of the ventricular fluid showed non-protein nitrogen 47 mg. per cent and a colloidal gold curve of 2233321000. The ventriculogram demonstrated dilatation of the lateral ventricles and third ventricle, with a shift of the ventricular system to the right. A large mass was seen in the left lateral ventricle posteriorly, near the region of the glomus. There were irregular, small bubbles of air trapped in the furrows of the tumor (Figs. 1 and 2).

A left parietal craniotomy was then done, and the cortical transection was carried down to the lateral ventricle. A small amount of extraventricular tumor was encountered, and the left lateral ventricle was entered. A large, firm, red, vascular mass was found in this location and almost completely removed.

The patient was returned to her room and soon showed signs of increased intracranial pressure. The bone flap was re-elevated to rule out the possibility of extradural clot or left ventricular block. No clot was found but the dura was quite tense. A few du-

[1] From the Departments of Radiology, Hospital of St. Raphael and Yale University School of Medicine. Accepted for publication in April 1950.

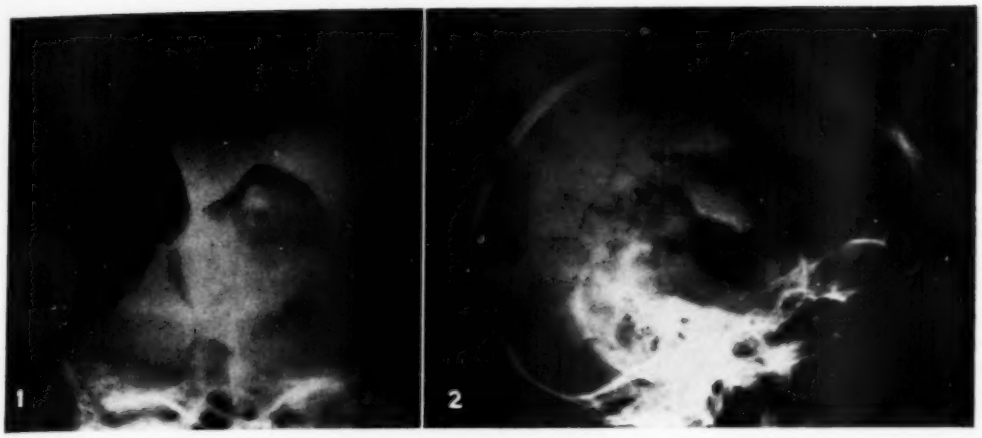

Fig. 1. Anteroposterior ventriculogram demonstrating dilated right lateral ventricle, third ventricular shift to the right, and deformed left lateral ventricle, with large intraventricular tumor. Note the irregular collection of air within the tumor.

Fig. 2. Left lateral ventriculogram showing dilated right lateral ventricle and third ventricle with bizarre collection of air in the posterior portion of the tumor in the left lateral ventricle.

ral sutures were removed and the brain was incised. The tumor bed and ventricle were visualized and a gush of bloody ventricular fluid escaped as soon as a brain spatula was introduced. The ventricle was then irrigated and a catheter was inserted and brought out to drain into the dressing. Following a stormy postoperative course, marked by repeated episodes of respiratory distress necessitating tracheobronchial aspiration, the patient died on Nov. 6, 1948.

At necropsy, the brain showed a large postoperative defect in the left parietal lobe which extended almost to the brain stem. On the left the brain stem was almost completely replaced by hemorrhagic, necrotic material which extended across the midline to involve the right half as well. At this level, the tumor had dissected through the corpus callosum. The tumor extended about 2 cm. anteriorly, to the plane of the mammillary bodies and posteriorly about 4 cm. as a discrete mass. There was also dark reddish brown material in the fourth ventricle, extending between the brain stem and the cerebellum at that level.

Microscopically, the sections showed a remarkably cellular tumor with numerous multinucleated giant cells scattered throughout. There was a fairly loose meshwork with eosinophilic strands which did not stain green with Masson's stain. The cells varied greatly in size and shape. There were numerous mitotic figures and many blood vessels. In certain areas, the typical streaming effect of bundles of spongioblasts was observed, with fairly good differentiation into spongioblasts and astrocytes. In other areas, considerable hemorrhage was present, with a few small zones of necrosis. Only a few vessels showed any changes in the walls. The pathologic diagnosis was glioblastoma multiforme (Fig. 3).

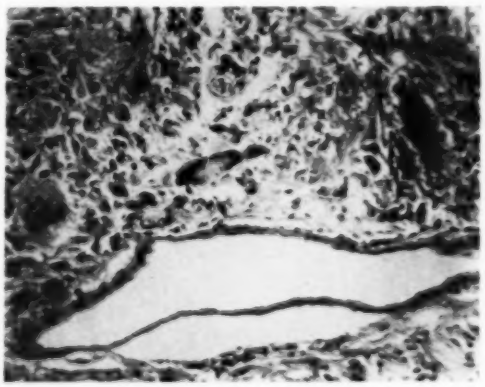

Fig. 3. Photomicrograph of section of tumor. Note its cellularity, the variability in cell size and shape, and multinucleated giant cells (× c.200).

DISCUSSION

The radiologist is frequently able to predict correctly the histologic nature of a lesion from a study of the roentgenograms. This ability is based on a careful correlation of the gross pathologic and roentgen findings. In general, this practice is commendable, but it can lead to errors in diagnosis if critical caution is not exercised. It is of paramount importance to recognize that histologically different lesions can produce similar gross pathologic pictures and hence similar roentgen findings. Thus, the pneumographic findings said to

be characteristic of intraventricular epidermoids occur also in intraventricular glioblastoma multiforme. These findings are not specific and can probably be produced by any large, irregular intraventricular tumor.

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BIBLIOGRAPHY

1. DYKE, C. G., AND DAVIDOFF, L. M.: Encephalographic Appearance of Intraventricular Epidermoid. Bull. Neurol. Inst. N. Y. **6:** 489–493, December 1937.

2. DYKE, C. G.: In Diagnostic Roentgenology, edited by Ross Golden. New York, Thomas Nelson & Sons, 1941.

3. CHILDE, A. E., AND YOUNG, A. W.: Pneumographic Diagnosis of Intraventricular Epidermoid. Report of Case. Radiology **48:** 56–60, January 1947.

4. HAUSER, H., AND ELKINS, C. W.: Intraventricular Epidermoid. Characteristic Pneumoencephalographic Findings. Radiology **52:** 69–74, January 1949.

5. KRIEG, W.: Aseptische Meningitis nach Operation von Cholesteatomen des Gehirns. Zentralbl. f. Neurochir. **1:** 79–86, 1936.

6. WEINBERGER, L. M.: Intracerebral Epidermoid Tumors—Characteristic Encephalographic Finding. J. Mt. Sinai Hosp. **5:** 565–572, November-December 1938.

SUMARIO

Glioblastoma Intraventricular Múltiple con las Características Neumográficas del Epidermoide Intraventricular

El hallazgo encefalográfico de numerosas y peculiares aglomeraciones globulares y lineales de aire atrapado entre los repliegues de la pared de un tumor ha sido considerado como patognomónico de epidermoides intraventriculares. El A. comunica un caso de glioblastoma multiforme intraventricular (comprobado en la autopsia) que revelaba ese mismo cuadro roentgenológico, el cual, para él, puede probablemente ser producido por cualquier tumor intraventricular grande e irregular. Apunta a la vez la necesidad de desplegar cautela analítica al predecir, por los hallazgos roentgenológicos, la naturaleza histológica de una lesión.

Pheochromocytoma with Calcification Simulating Cholelithiasis

Report of a Case[1]

MARVIN MOSER, M.D., GEORGE SHEEHAN, M.D., and HAROLD SCHWINGER, M.D.

PHEOCHROMOCYTOMA as a cause of both paroxysmal and sustained hypertension is being reported with increasing frequency. Smithwick (1) found 5 such medullary tumors in 1,000 cases of hypertension explored during sympathectomy, but the actual incidence of pheochromocytoma has not been established. The typical syndrome associated with this tumor is well known. The attacks have been variously described but correspond to any or all the effects of epinephrine administration. Sustained hypertension similar to that produced by various etiologic agents, known or unknown, is no longer a rarity. To be considered in reaching a differential diagnosis are hysteria, psychoneurosis, menopausal syndrome, the diencephalic syndrome (2), diabetes mellitus, hyperthyroidism, essential hypertension, tabes dorsalis (3), and other hypertensive states.

Since the tumor and the resultant signs and symptoms are amenable to surgery, many investigators have presented tests and procedures to establish the diagnosis. The clinical tests include the use of the following agents: histamine (4), mecholyl (5), benzodioxane (6), dibenamine (7), epinephrine (8), and tetraethyl ammonium bromide or chloride (9). This last named agent was introduced by LaDue, Murison, and Pack and produces a rise in blood pressure in the patient with a pheochromocytoma. This action has been explained by Moe (10) as due to a blockade of the autonomic reflexes which normally adjust to excess pressor substances in the blood. Various other criteria have been utilized by Cahill (11) for establishing the diagnosis.

We have recently observed a pheochromocytoma with a circular calcific shadow simulating a gallstone but actually representing calcification within the tumor. The patient also had persistent hypermetabolism (12) and diabetes mellitus and gave a positive response to Etamon (tetraethyl ammonium chloride).

CASE REPORT

A 44-year-old Negro was admitted to the surgical service on July 7, 1948, because of abdominal pain, nausea, and vomiting. He had been in good health until three months prior to admission, when he began to experience daily nausea and vomiting, especially in the morning. The vomitus was not bloody, nor was it originally associated with pain. One month prior to admission, however, severe, colicky right upper quadrant pain developed, radiating to the back and under the right shoulder, accompanied by vomiting. Episodes of this nature occurred four or five times daily, lasted for fifteen or twenty minutes, and were said to take place approximately half an hour after meals, especially after ingestion of fatty foods. The patient was never awakened at night by pain; he had no fever, chills, headaches, or dizziness during the attacks, and did not obtain relief on ingestion of food. A roentgenogram of the abdomen was reported as showing a gallstone, the size of a quarter. For the past two years the patient had perspired profusely. Two years prior to admission his blood pressure had been recorded as 170 systolic, but after one week of bed rest had returned to normal. There was no history of diabetes or any other illness except syphilis eight years previously, which had been adequately treated. On admission, the blood pressure was 130/100, pulse 120, respirations 30, temperature 99° F.

Positive findings on physical examination included a palpable firm smooth thyroid gland, basal râles over both lung fields, a forceful apex beat with enlargement of the heart to the left, and marked tenderness to palpation in the right upper quadrant, with some spasm over the same area. The liver was palpable 6 to 8 cm. below the right costal margin, and there was some edema of the ankles. The diagnosis was acute cholecystitis and cholelithiasis and hypertensive cardiovascular disease with minimal congestive heart failure.

The white blood count was 12,000, with 76 per cent neutrophils, 6 per cent monocytes, 16 per cent lymphocytes, 2 per cent basophils; hemoglobin, 13.5

[1] From the Long Island Medical Service, Kings County Hospital, Brooklyn, N. Y. Accepted for publication in March 1950.

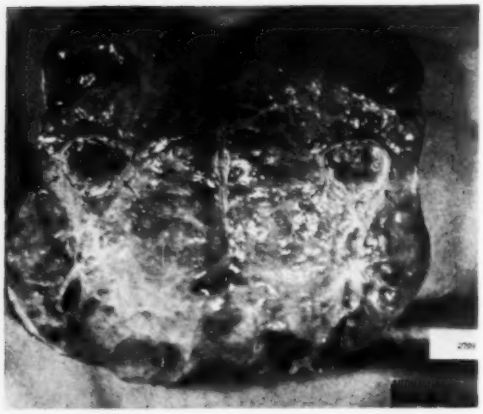

Fig. 1. Pheochromocytoma of right adrenal gland showing area of circular calcification within the tumor.

gm. There was a 4 plus albuminuria and 3 plus glycosuria, with a specific gravity of 1.022. The blood urea was 33 mg. per 100 c.c., sugar 222 mg. per 100 c.c., albumin 3.4 gm. per 100 c.c., globulin 3 gm. per 100 c.c., total protein 6.4 gm. per 100 c.c.; cephalin flocculation test 1 plus, icterus index 8, alkaline phosphatase 10 Bodansky units, Mazzini reaction 1 plus, Kahn and Kolmer tests negative. X-ray films showed enlargement of the transverse cardiac diameter, incomplete pneumonic consolidation in the right mid-lung field and a ring-like calcific shadow in the right upper quadrant, suggestive of a gallbladder calculus.

The patient responded well to therapy, consisting of salt restriction, diuretics, digitalis, and penicillin, but there was continued glycosuria, 2 to 3 plus, with a blood sugar of 334 to 400 mg. per 100 c.c. Insulin therapy was instituted, but the urine was not rendered sugar-free.

Roentgenograms on July 10 revealed a clearing of the process in the right lung, with a residual platelike atelectasis over the right diaphragm, and nonfilling of the gallbladder. Blood pressures taken on the surgical service were reported as follows: July 8, 160/120; July 10, 170/120; July 15, 160/110.

On July 18 the patient was transferred to the medical service. His blood pressure was now 220/120 and his pulse 100; he was perspiring profusely. The lung fields were clear, the heart was enlarged to the left, and the liver edge was palpable 2 cm. below the right costal margin. The prothrombin time was normal; the sedimentation rate 12 mm. in sixty minutes. An electrocardiogram revealed occasional ventricular premature beats with flat T waves in leads 1, 2, and 3. The basal metabolism rate on July 22 was plus 24; on July 26, plus 25. The circulation time was 10 seconds (decholin) and the venous pressure was 100 mm. of water. Creatine/creatinine ratio for twenty-four-hour urine was 1 to 6 on July 22 and 1 to 4 on July 26. The blood sugar varied between 90 and 150 mg. per cent. The patient was given 20 units of protamine zinc insulin before breakfast but continued to exhibit 1 to 2 plus glycosuria. Glycosuria, however, did not occur during periods of normal blood sugar.

Roentgenograms now showed normal filling and emptying of the gallbladder with a calcific ring in the right upper quadrant about 2 cm. in diameter and fixed in position posteriorly and 3 cm. below the diaphragm. The calcification was believed to be in the liver or adrenal gland. Intravenous pyelography showed adequate function of both kidneys but a slight degree of rotation of the calyceal system of the right kidney, which was believed to be due to a renal mass or a mass above the kidney. The patient refused to allow retrograde pyelography or perirenal air studies.

Because of findings signifying hypermetabolism, an unusual type of diabetes, and calcification in the right upper quadrant, studies were undertaken to demonstrate a pheochromocytoma.

Daily blood pressures ranged from 190/110 to 250/140. A sodium amytal test showed no consistent fall in pressure, a cold pressor test no rise. After 100 mg. of tetraethyl ammonium chloride the pressure rose in three minutes from 230/130 to 250/150.

The patient left the hospital against advice on July 28 and was readmitted Oct. 4, 1948, with a history of two bouts of severe throbbing fronto-occipital headache and a fleeting episode of ataxia and left arm weakness with some dizziness. Twenty-four hours prior to admission he was suddenly unable to speak and lost all power in the right upper and lower extremities. Admission blood pressure was 160/100 and signs of right-sided hemiplegia were present. The urine showed 2 plus albumin but with insulin administration was sugar-free. Blood pressure varied between 130 and 140 systolic and 100 and 110 diastolic. Death ensued on the thirteenth hospital day after the temperature had risen to 107° F.

At necropsy the following findings were noted: The heart was enlarged and weighed 520 gm., with diffuse replacement fibrosis and hypertrophy of the muscle bundles. The lungs, spleen, and liver were congested, and a large infarct was noted in the upper lobe of the right lung. The left adrenal was normal in size with the cortical architecture well preserved. The medulla contained prominent well formed basophilic cells that were arranged somewhat irregularly. The capsule was not thickened. In some areas a tendency toward the formation of small papillary growths was noted. A tumor measuring 10 × 7.5 × 4 cm. and weighing 300 gm. was adherent to the upper pole of the right kidney. It was pink, succulent, and contained a calcified area 1.5 cm. in diameter and areas of hemorrhage (Fig. 1). Some yellowish normal adrenal tissue was observed on the surface. Irregular masses of tumor cells were seen arranged in small clusters, singly, and in papillary formations. The individual cells varied in size and

shape; most were characterized by a regular cuboidal or pyramidal shape and deeply staining pink cytoplasm with hyperchromatic nuclei. Other cells were larger and more irregular in shape, occasionally resembling ganglion cells. Throughout were interlacing strands of supporting collagenous connective tissue lined by tumor cells. The wall of the cystic structure was calcified and was limited to the area where dense fibrous tissue had replaced most of the tumor cells. Diagnosis: Right pheochromocytoma with hemorrhage and calcification.

Fig. 2. Roentgenogram showing good filling of gallbladder and presence of circular calcific shadow above this organ.

DISCUSSION

The initial roentgen examination of this hypertensive patient, whose presenting symptoms were vomiting and right upper quadrant pain, revealed a ring-shaped calcific deposit in the right upper quadrant of the abdomen. Further studies demonstrated that this deposit was outside the gallbladder (Fig. 2), within a mass which depressed the superior pole of the right kidney but was distinct from the renal shadow (Fig. 3). This all pointed to an adrenal tumor or a mass situated within the adrenal region. The type of calcification, however, did not correspond to the type of adrenal tumor suspected clinically, namely, a pheochromocytoma.

Fig. 3. Intravenous pyelogram showing rotation of the calyceal system on the right, probably due to a mass above the kidney. Circular calcific shadow again observed above the kidney.

Calcification within adrenal tumors, benign and malignant, has been described in the literature on numerous occasions. A careful search of the literature, however, revealed only one case of such calcification within a pheochromocytoma (13). Brunschwig (14) reported a case of a circular calcification within an adrenal cyst in a patient with hypertension, but microscopic examination of the excised specimen failed to reveal any evidence of a medullary tumor. Tenenbaum, in discussing cases of pheochromocytoma reported by Hyman and Mencher (13), described a ring-shaped calcific deposit in a pheochromocytoma identical to that in the present case. He stated that such calcification might be of diagnostic value in future cases and claimed that none other had been reported in the literature up to that time.

It is well known that almost any tumor which is slow growing and vascular may calcify. Since the pheochromocytoma is such a tumor, calcification may be expected

to occur. The most likely type to be anticipated would be a localized area of calcification or perhaps a generalized speckled calcification within the growth. Kerr (15) mentions such a case in his handbook on the urinary tract. The ring-shaped structure found in our case is felt to be quite unusual. The most probable explanation for its occurrence is on the basis of a previous localized hemorrhage within the tumor with secondary necrosis and calcium deposition during the walling-off process.

SUMMARY

A case of pheochromocytoma with calcification simulating cholelithiasis is presented. In addition to the above unusual finding the patient also showed persistent hypertension, diabetes, and hypermetabolism. A positive response to Etamon (tetraethyl ammonium chloride) was also obtained.

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REFERENCES

1. SMITHWICK, R.: Quoted by Goldenberg, Snyder, and Aranow (6).
2. PAGE, I. H., AND CORCORAN, A. C.: Arterial Hypertension: Its Diagnosis and Treatment. Chicago, Year Book Publishers, 1945.
3. BENNETT, I. L., JR., AND HEYMAN, A.: Paroxysmal Hypertension Associated with Tabes Dorsalis. Report of Three Cases. Am. J. Med. **5:** 729–735, November 1948.
4. ROTH, G. M., AND KVALE, W. F.: Tentative Test for Pheochromocytoma. Am. J. M. Sc. **210:** 653–660, November 1945.
5. GUARNERI, V., AND EVANS, J. A.: Pheochromocytoma. Report of a Case, with a New Diagnostic Test. Am. J. Med. **4:** 806–813, June 1948.
6. GOLDENBERG, M., SNYDER, C. H., AND ARANOW, H., JR.: New Test for Hypertension Due to Circulating Epinephrine. J. A. M. A. **135:** 971–976, Dec. 13, 1947.
7. HOCH, G. F.: Pheochromocytoma with Paroxysmal Hypertension. J. Urol. **61:** 473–476, March 1949.
8. MAYOCK, R. L., AND ROSE, E.: Insensitivity to Epinephrine in a Patient with Functioning Tumor of the Adrenal Medulla. Am. J. M. Sc. **213:** 324–330, March 1947.
9. LADUE, J. S., MURISON, P. J., AND PACK, G. T.: Use of Tetraethylammonium Bromide as a Diagnostic Test for Pheochromocytoma. Am. J. Med. **3:** 118, July 1947. (Abstract from Proceedings of the American Federation for Clinical Research).
10. MOE, G. K.: Potentiation of Pressor Action of Epinephrine by Tetraethyl Ammonium. J. A. M. A. **137:** 1115–1116, July 24, 1948.
11. CAHILL, G. F.: Pheochromocytomas. J. A. M. A. **138:** 180–186, Sept. 18, 1948.
12. GANEM, E. J., AND CAHILL, G. F.: Pheochromocytomas Coexisting in Adrenal Gland and Retroperitoneal Space, with Sustained Hypertension. New England J. Med. **238:** 692–697, May 13, 1948.
13. HYMAN, A., AND MENCHER, W. H.: Pheochromocytoma of the Adrenal Gland. J. Urol. **49:** 755–776, June 1943.
14. BRUNSCHWIG, A.: Paroxysmal Hypertension from Pheochromocytoma. J. A. M. A. **134:** 253–254, May 17, 1947.
15. KERR, H. D., AND GILLIES, C. L.: The Urinary Tract: A Handbook of Roentgen Diagnosis. Chicago, Year Book Publishers, 1944, p. 134.

SUMARIO

Feocromocitoma con Calcificación que Simulaba Colelitiasis

El caso presentado es de feocromocitoma comprobado en la autopsia, con calcificación que simulaba colelitiasis. El examen roentgenológico reveló un depósito anular calcificado en el hipocondrio derecho. Descubrióse después que el mismo quedaba fuera de la vesícula biliar y dentro de una tumefacción que deprimía el polo superior del riñón derecho, pero que era distinta de la imagen renal. Aunque se sospechaba feocromocitoma, la forma de la calcificación era diferente de la observada habitualmente en dichos tumores, no habiéndose comunicado hasta ahora más que un caso semejante.

Además del precitado hallazgo extraño, el enfermo revelaba hipertensión persistente, diabetes e hipermetabolismo. También se obtuvo una respuesta positiva al Etamón (cloruro tetraetílico de amonio).

Annular Pancreas

A Case Report[1]

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ANNULAR PANCREAS is of rare occurrence. A review of the literature showed some 15 cases in which operation was done, but few references to the condition were discovered in textbooks or journals of roentgenology. Indeed, the only illustration of the condition to be found in any roentgenologic text was a line drawing in Feldman's *Clinical Roentgenology of the Digestive Tract* (1).

Most cases of annular pancreas are discovered on the operating table or at autopsy. Preoperative diagnosis is almost unheard of. The case to be reported here is therefore of special interest, since the anomaly was strongly suspected before operation.

The case may be regarded as typical in that the clinical and roentgen findings were such as would be expected in a patient with a ring of pancreatic tissue around the duodenum. The probability of an annular pancreas was first suggested, however, by the surgeon, on viewing the films. As it happened, he had seen another case, reported by Lehman (2), which came to operation, in which the x-ray appearance was almost identical. Once an example has been encountered and impressed upon the mind, any subsequent case is pretty obvious.

CASE REPORT

The patient was a three-and-a-half-year-old white boy who had suffered from intermittent pain in the epigastrium for at least one year. The parents stated that ever since he could talk, he had complained about his stomach. There was occasionally a little vomiting associated with the pain, but not always. The child was one of fraternal twin boys and was equal in development to his brother.

At the first examination, July 25, 1949, the esophagus and stomach were found to be normal. The first portion of the duodenum was slightly dilated,

Fig. 1. Appearance at first examination, showing constricting lesion in the second portion of the duodenum, with dilatation above this level.

as was the proximal part of the second portion. There was a smoothly margined defect about 1 cm. in diameter along the lesser curvature of the duodenum some 5 cm. from the pylorus (Fig. 1). The lumen was here reduced to a few millimeters, and passage of barium through the area was slowed. Below this level, there was no apparent abnormality. There was no tenderness over the defect. Our impression was partial obstruction of the duodenum, probably by adhesions or aberrant blood vessels. The possibility of spasm was not ignored, however, and the patient was treated with antispasmodics and antacids for three weeks. A repeat examination at the end of that time revealed exactly the same picture (Fig. 2). By this time, however, we were fairly certain that we were dealing with a case of annular pancreas, because of the resemblance of the films to those of Lehman's earlier case.

On Aug. 31, 1949, the patient was operated on, and a ring of pancreatic tissue, from the head of the pancreas, was found completely encircling the second

[1] From the Martha Jefferson Hospital, Charlottesville, Va. Accepted for publication in May 1950.

Fig. 2. Appearance three weeks after Fig. 1, showing practically the same picture.

portion of the duodenum, partially encroaching on the lumen and causing dilatation above that level. Otherwise, the exploratory examination was negative. A section of the encircling tissue was removed, allowing expansion of the narrowed portion of the duodenum, and the abdomen was closed. Recovery was uneventful.

Five months later, a recheck by fluoroscopy was done. There was no delay in passage of the barium and only slight residual deformity. In fact, so rapidly did the barium pass through the duodenal loop that satisfactory films of the area were not obtained. The patient was almost free from symptoms at that time, with only occasional twinges of pain. Six weeks later, another check was made in an effort to get better postoperative films. The patient was now essentially asymptomatic. The degree of deformity as observed fluoroscopically seemed to have decreased, but again we failed to catch a bolus of barium in the duodenum.

Examination of the twin brother at this time failed to reveal any abnormality of the stomach or duodenum.

NOTE: The surgical aspects of this condition will be discussed in a forthcoming article by H. L. Archer, M.D., the surgeon concerned with this case.

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REFERENCES

1. FELDMAN, M.: Clinical Roentgenology of the Digestive Tract. Baltimore, Williams & Wilkins Co., 2d ed., 1945, p. 665.

2. LEHMAN, E. P.: Annular Pancreas as a Clinical Problem. Ann. Surg. **115:** 574–585, April 1942.

3. STOFER, B. E.: Annular Pancreas. Tabulation of Recent Literature and Report of a Case. Am. J. M. Sc. **207:** 430–435, April 1944.

4. GROSS, R. E., AND CHISHOLM, T. C.: Annular Pancreas Producing Duodenal Obstruction. Report of Successfully Treated Case. Ann. Surg. **119:** 759–769, May 1944.

SUMARIO

Páncreas Anular: Historia Clínica

El caso descrito es de páncreas anular en un niño de tres años y medio de edad. El estudio roentgenográfico reveló una deformación de bordes lisos y aproximadamente de 1 cm. de diámetro a lo largo de la curvatura menor del duodeno y a unos 5 cm. del píloro, reduciendo la luz a unos pocos milímetros. Al operar, se descubrió un anillo de tejido de la cabeza del páncreas que circundaba la segunda porción del duodeno e invadía parcialmente la luz. Extirpóse una sección del tejido circundante, y el examen subsiguiente no reveló más que una leve deformidad.

Traumatic Liver Cyst[1]

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DUE TO ITS LARGE size, relative fixation, and poor elasticity, the liver is commonly involved in thoracoabdominal injuries. War casualty reports (1, 2) show it to be the abdominal organ most frequently injured by direct (penetrating, percutaneous) force, the incidence being reported as 27 to 57 per cent of all thoracoabdominal injuries.

Indirect (non-penetrating, subcutaneous, blunt, crushing) force causes trauma to the liver at least as frequently as it does to the spleen, the combined hepatosplenic incidence being 72 per cent of intra-abdominal injuries. The motor vehicle is the major offender. In this blunt-force category, liver injury has been reported as occurring in one of 1,100 to 1,300 general hospital admissions for trauma (3, 12).

Hitzrot (5) classified subcutaneously induced liver injuries as follows:

1. *Transcapsular* (the most common type): The parenchyma and capsule are both torn, the degree of injury ranging from small, shallow tears through the capsule to complete severance of a large portion or even the entire lobe. There is a rough parallel between the degree of force and the degree of injury.

2. *Subcapsular:* The capsule is intact, but there is underlying parenchymal injury ranging from small subcapsular or central hematomas to huge disruptions.

(*a*) *Subcapsular hematomas* are due to rupture of small blood vessels between the capsule and the parenchyma. The hematomas are usually on the superior surface of the right lobe (43 per cent of cases) (4). They probably heal without incident unless complicated by infection.

(*b*) *Central ruptures* are closed parenchymal cavities filled with blood and necrotic liver tissue. Small ruptures tend to heal with the formation of scars; in larger ones infarcts or sequestra develop. If the damage is considerable, or there are repeated hemorrhages, a fibrous-walled cyst may arise. Bile may not be found if some time has elapsed before operative intervention and the torn biliary radicles have had time to become sealed.

The basic pathological findings are similar whether the injury be due to direct (penetrating) or indirect (subcutaneous) force. Following cessation of hemorrhage, there is drainage from the biliary system. Repair is effected by devitalized tissue autolysis and subsequent parenchymal and supportive tissue regeneration. During autolysis, the vascular and biliary tracts may be further opened, resulting in secondary hemorrhage and extravasation.

CLINICAL FINDINGS

Two-thirds to three-quarters of patients with liver injury die immediately or within the first six hours after admission because of overwhelming trauma. The mortality probably reaches 80 per cent among patients not operated upon. Conceivably the diagnostic roentgenologist could point a cogent finger and thus increase salvage—if he possessed a high index of suspicion on hepatic injuries.

In the thirty-odd per cent of patients having a chance of survival, the danger is not so much in the hepatic injury as in such complications as hemorrhage, infection, peritonitis, ileus, escape of large quantities of bile, and the forcing of liver tissue into the veins to form emboli localizing in the lung capillaries or inferior vena cava.

Primary jaundice may appear in two to four days after injury; jaundice occurring later may be of the absorption type; still later it may result from hepatitis, liver abscess, etc. An "hepatorenal syndrome" consisting of an increase, in the blood, of non-protein nitrogen and creatinine, icterus, and such renal findings as oliguria, anuria, red and white blood cells, casts, and albuminuria may occur occasionally.

In subcapsular injuries usually there is a

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considerable lapse of time before the recognition of serious abdominal trauma. The liver mass slowly develops over a period of days to weeks. Most of these patients will complain bitterly of pain referred to the right shoulder, inability to lie on the left side, and, not infrequently, there will be a dilatation of the superficial abdominal veins.

ROENTGEN FINDINGS

The more common radiographic signs of liver rupture are:

(1) Loss of, or gross variation in, liver outline.
(2) Signs of free peritoneal fluid (blood).
  (*a*) Over-all abdominal haziness.
  (*b*) Loss of differential of organ contours.
(3) Partial or complete ileus, with separation of gas-filled loops.
  (*a*) Disorganized small bowel motor pattern.
(4) Organ displacements.
  (*a*) Due to increased liver mass.
    Elevated right dome of diaphragm, splinted.
    Stomach displaced to the left and down.
    Hepatic flexure displaced downward.
    Downward displacement of right kidney.
  (*b*) Associated traumatic diaphragmatic rupture.
    Liver may be herniated into chest.
    Hepatic flexure may be high, normal, or low.
(5) Concomitant pulmonary effects.
  (*a*) Focal right basal atelectasis.
  (*b*) Right pleural effusion.
  (*c*) Right basilar pneumonitis.

CASE REPORT

In October 1948, a rubber-wheeled truck containing 40 sacks of fertilizer rolled over the upper abdomen of G. G., a 17-year-old colored male. After shock therapy, antibiotic prophylactic therapy, and an adequate period of observation, the patient was discharged from another hospital. Two weeks later he noticed a gradually enlarging mass in the right upper abdomen, from which his local physician aspirated 500 c.c. of "yellow pus" four weeks after the accident. Reappearance of the mass necessitated five subsequent weekly aspirations, affording progressively smaller yields.

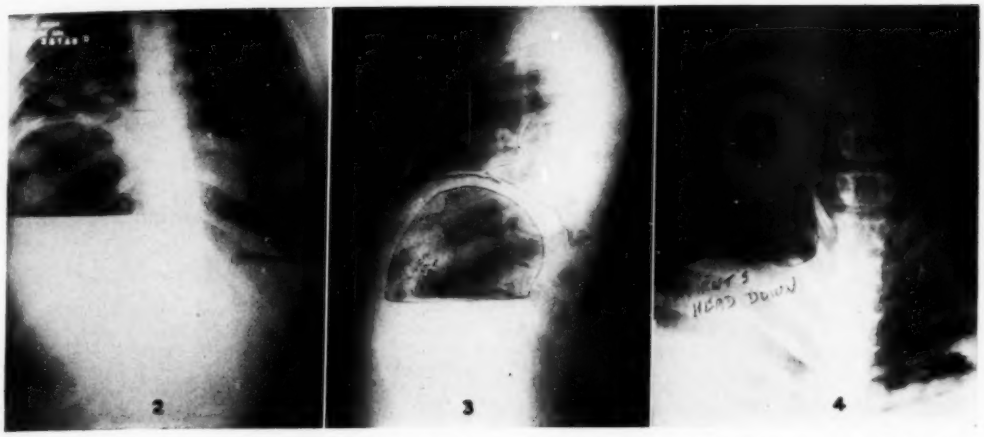
Fig. 1. Original roentgenogram, suggestive of a huge mass in the right upper quadrant of the abdomen, causing elevation of the diaphragm and pulmonary compression.

Four days prior to admission to University Hospital (three months after the accident) the patient became dyspneic and had episodes of nausea accompanied by bouts of hematemesis.

Physical examination on admission revealed a marked asymmetry of the trunk, a swelling of the right upper quadrant and thoracic cage, and flatness on percussion from the fourth right rib anteriorly to the iliac crest. The red cell count was 4,300,000; hemoglobin 13.5 gm.; white cells 8,300; prothrombin time 152 seconds; thymol turbidity 10.0 U. (MacLagen); serum bilirubin 0.2 mg. No amebae or other enteric pathogens were found.

Roentgen examination (Fig. 1) showed the relative absence of gas in the right upper quadrant, suggesting a huge mass, which apparently was causing both marked elevation of the right diaphragm and pulmonary compression, with an area of plate-like atelectasis in the base of the right lower lung field. There was pleural effusion as well. The colonic hepatic flexure was depressed, and an intravenous pyelogram demonstrated downward displacement of the right kidney, which was not compromised as to function.

For the first eighteen days after admission there was intermittent low-grade fever. The prothrombin time was not influenced by synkamin, vitamin K, and other supportive therapy. On the eighteenth hospital day, aspiration of the abdominal mass



Figs. 2–4. Roentgenograms taken in upright, decubitus, and head-down positions, demonstrating the huge cavity occupying the region of the right lobe of the liver.

yielded 1,400 c.c. of yellowish, turbid, rather thick fluid. The aspirated material was negative for bile, and no organisms were cultured. Air (600 c.c.) and penicillin were injected.

Films taken immediately in the erect, decubitus, and head-down positions (Figs. 2–4) demonstrated a huge cavity occupying the region of the right lobe of the liver. Inability to visualize any significant liver mass suggested that the cavity might be intrahepatic with perhaps just a shell of liver tissue about it.

After four succeeding taps (each yielding about 1,500 c.c., representing about one-half the total fluid present) and supportive therapy, the patient's temperature went down to normal and the prothrombin time to thirty seconds. The cavity, however, showed no over-all decrease in size or tendency toward obliteration. Consequently, two months after admission, exploration was undertaken. The shell of liver tissue was of normal color and about 1 cm. thick. A huge fluid mass occupied the right lobe. Following aspiration an attempt was made to explore the cavity, but its limits were out of reach of the finger. Direct visualization revealed a mass of necrotic material which appeared to be a skeletonized portion of the duct system. A biopsy of this mass was reported to show an inner layer of granulation and an outer layer of dense fibrotic tissue.

In one month of continuous postoperative drainage the liver cavity decreased to sinus-tract size. Six weeks later the sinus tract had disappeared, and the patient was in good health, without evidence of disabling sequelae.

DISCUSSION

The case reported indicates that destruction of more than 50 per cent of the liver in cases of central rupture is not incompatible with complete patient recovery, provided surgical treatment is adequate. This is in accord with experimental studies (13) demonstrating that half of the liver may be removed without serious impairment of function.

It seems to be the consensus of opinion that, after control of the initial shock, treatment of subcutaneous rupture of the liver, whether subcapsular or central, should be surgical. Bleeding continues in spite of the low portal pressure, since the walls of the veins are thin and contain few elastic fibers.

As pointed out above, the liver is the abdominal viscus most frequently injured. The diagnosis should therefore be suspected in any trauma involving the abdomen. Determination of the type of rupture may be most difficult, but is non-essential, since the treatment is surgical in any case. Transcapsular ruptures should be operated on because of the threat to life from hemorrhage; central ruptures should be operated upon even if the hemorrhage is controlled, since usually this type of rupture leads to infection or disturbance of liver function.

In the case reported, the delay in operating was due to the chronicity of the process at the time the patient was first seen in this hospital. In retrospect, it appears that operation should have been done earlier, when the anatomical location of the abscess

was demonstrated roentgenographically. The case was most unusual clinically for several reasons:

1. There was no bile in the aspirated material from the abscess. Usually bile is found in such cases, due to the rupture of numerous bile canaliculi.
2. There was no infection.
3. The liver destruction was of such extent that the patient's general health was seriously compromised, due to the disturbance in liver function.
4. The huge abscess, completely replacing the right lobe and covered by a shell of liver, was estimated to have a capacity of 2,800 to 3,000 c.c.

CONCLUSION

The authors present a case of central liver rupture which resulted in almost complete replacement of the right lobe of the liver by a huge fibrous-walled cyst.

It is suggested that a high radiologic index of suspicion may be helpful in the earlier institution of appropriate surgical management in cases which do not prove fatal soon after the occurrence of liver injury. It is this group, constituting about a third of all cases, in which greater salvage may be achieved.

REFERENCES

1. MARTIN, J. D., JR.: Wounds of the Liver. Ann. Surg. **125:** 756–767, June 1947.
2. MADDING, G. F., LAWRENCE, K. B., AND KENNEDY, P. A.: War Wounds of the Liver. Bull. U. S. Army M. Dept. **5:** 579–589, May 1946.
3. THORLAKSON, P. H. T., AND HAY, A. W. S.: Rupture of the Liver. Canad. M. A. J. **20:** 593–598, June 1929.
4. WRIGHT, L. T., PRIGOT, A., AND HILL, L. M., JR.: Traumatic Rupture of Liver without Penetrating Wounds. Study of 32 Cases. Arch. Surg. **54:** 613–632, June 1947.
5. HITZROT, J. M.: Subcutaneous Injuries of the Liver. Ann. Surg. **66:** 50–63, July 1917.
6. PILLMORE, G. U., editor: Clinical Radiology. Philadelphia, F. A. Davis Co., 1946.
7. TAYLOR, J. H.: Massive Apoplexy of the Liver. Am. J. Surg. **24:** 373–377, May 1934.
8. KRIEG, E. G.: Hepatic Trauma: Analysis of 60 Cases. Arch. Surg. **32:** 907–914, May 1936.
9. ROBERTSON, D. E.: Rupture of the Liver Without Tear of the Capsule. Ann. Surg. **106:** 467–469, September 1937.
10. ORR, T. G., AND HELWIG, F. C.: Liver Trauma and the Hepatorenal Syndrome. Ann. Surg. **110:** 682–692, October 1939.
11. MCCORKLE, H., AND HOWARD, F. S.: Severe Trauma to the Liver with the "Hepatorenal Syndrome," Ann. Surg. **116:** 223–230, August 1942.
12. FOX, D. B.: Thoracoabdominal Wounds. Review of 270 Cases. Surg., Gynec. & Obst. **82:** 64–70, January 1946.
13. MANN, F. C.: Effects of Complete and Partial Removal of the Liver. Medicine **6:** 419–511, December 1927.
14. VANCE, B. M.: Subcutaneous Injuries of the Abdominal Viscera. Arch. Surg. **16:** 631–679, March 1928.
15. CHRISTOPHER, F.: Rupture of the Liver. Ann. Surg. **103:** 461–464, March 1936.

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SUMARIO

Quiste Traumático del Hígado

Los AA. presentan un caso de rotura central de hígado que culminó en la sustitución casi total del lóbulo derecho del órgano por un enorme quiste de paredes fibrosas. El examen roentgenológico mostró relativa ausencia de aire en el hipocondrio derecho, sugiriendo la presencia de una tumefacción que ocasionaba pronunciada elevación del diafragma y compresión pulmonar, con una zona de atelectasia en forma de placa en la base del campo pulmonar inferior derecho. La flexura hepática del colon estaba deprimida y el riñón derecho desplazado, aunque revelando función normal. Las radiografías subsiguientes revelaron una enorme cavidad en el lóbulo derecho. A pesar de haberse demorado la operación más de cinco meses después del accidente y dos meses después del ingreso del enfermo en el hospital con signos de absceso intrahepático y disfunción del hígado, la reposición fué completa.

Indícase que, radiológicamente, puede resultar útil una suspicacia extremada en la investigación inicial del tratamiento quirúrgico más apropiado para los casos que no resultan mortales poco después de sobrevenir lesiones hepáticas. En este grupo, que constituye aproximadamente la tercera parte del total de casos, es en el que pueden salvarse más enfermos.

Sulfhydryl-Containing Agents and the Effects of Ionizing Radiations

I. Beneficial Effect of Glutathione Injection on X-Ray Induced Mortality Rate and Weight Loss in Mice[1]

W. H. CHAPMAN, A.B., C. R. SIPE, HMC, USN, D. C. ELTZHOLTZ, HMC, USN, E. P. CRONKITE, M.D., and F. W. CHAMBERS, JR., B.S.

TOTAL BODY EXPOSURE to ionizing radiations results in widespread cellular damage which is manifest by the promptly ensuing "toxemia" known as radiation illness. The cellular damage has in the past been considered largely due to (*a*) protein denaturation and (*b*) the formation of "toxic products." These concepts resulted in various forms of symptomatic and replacement therapy for radiation illness. Recent reports have stimulated new investigative and therapeutic endeavor in this field by calling attention to the effects produced by the ionization products of irradiated water on the sulfhydryl enzyme systems.

These ionization products of irradiated water (OH, O_2H and H_2O_2, etc.) (1, 2) are active oxidizing agents and have been shown to inhibit the sulfhydryl-containing enzymes (3–6), the degree of inhibition being directly related to the dosage of radiation. High doses of radiation produce irreversible enzymatic inhibition presumably by protein denaturation, whereas the inhibition from low doses may be reversed by the addition of glutathione (3–7). In fact, Shirai (8) has reported beneficial effects following glutathione treatment of 32 patients who were known to be suffering from roentgen intoxication as a result of x-ray therapy for uterine carcinoma.

As a result of these observations, it was considered desirable to study the effect of glutathione and other sulfhydryl-containing compounds on the course of radiation illness. The other —SH compounds considered for this study were dithiopropanol (BAL) and cysteine. BAL contains more sulfhydryl per mole than the other agents but is extremely toxic. Cysteine and glutathione are relatively nontoxic.

Glutathione was selected for the initial experiments, in preference to cysteine, for the following reasons: Mammalian tissues all contain appreciable amounts of glutathione but only small amounts of free cysteine or cystine, indicating that the organism makes some effort to keep glutathione intact. There is also evidence that glutathione may be less affected than cysteine by the action of certain enzymes present in tissues. For example, one enzyme, "cysteine disulfhydrase," is known to produce H_2S from cysteine, but not from glutathione (9). In addition, the role of glutathione in enzymatic reactivation (10, 11, 12) and cellular metabolism (7, 10, 13–16) further suggested its selection.

Barron and Singer (17, 18) showed that a large number of enzymes need the —SH group in order to catalyze the metabolism of fats, carbohydrates, and proteins. They suggested that the action of glutathione in cellular systems was that of continuous reactivation of these —SH enzymes. Voegtlin (13) suggested that the reducing action of glutathione would maintain the activity of the enzymes that catalyze protein synthesis and thereby favorably influence growth. Voegtlin and Chalkley (19) both reported that glutathione accelerates nuclear growth and mitosis. It has also been shown that embryonic and some cancer tissues contain larger amounts of glutathione than normal tissues (20–22).

[1] The opinions or assertions contained herein are the private ones of the authors and are not to be construed as official or reflecting the views of the Navy Department or the naval service at large. From the Naval Medical Research Institute, National Naval Medical Center, Bethesda, Maryland. Accepted for publication in March 1950.

When basing glutathione determinations on iodiometric titrations, however, one must correct for the ascorbic acid present (23, 24). Rowntree (25) reported acceleration of the growth and development of succeeding generations of rats by use of a thymus extract which was later found to consist, in part, of glutathione, cysteine, and ascorbic acid (26–28). Sherrod and Struck (29), using pure glutathione claimed that this compound was not responsible for the results which had been obtained by Rowntree, while Astrup and Fischer (30), working with malt extracts in tissue cultures, limited the function of glutathione to that of an accessory growth substance.

If glutathione *does* have any accelerating effect on growth and development, that property would be a valuable adjunct to the previously suggested action of this agent (—SH enzyme reactivation at the time of irradiation), for, if growth or growth factors could be stimulated in irradiated animals, their chances for survival might be improved. However, the reason for implicating —SH compounds as accelerators of cell division is based on the fact that —SH concentration is usually high when cell division is rapid, and, as far as the function of glutathione in growth processes is concerned, this type of circumstantial evidence might prove to be fallacious.

Having selected glutathione for our initial work with —SH compounds, we designed our experiments to test its effect on irradiated animals with respect to (*a*) survival, (*b*) growth and development, and (*c*) resistance to trauma.

The results of the first experiments with mice are presented in this report. Glutathione was injected either *before* or both *before and after* exposure to irradiation. Subsequent reports will deal with the results of glutathione injection *after* exposure to irradiation, and the effect of this agent on blood and biochemical and histologic changes following varying doses of x-rays.

MATERIALS AND METHODS

A total of 1,200 Swiss albino mice from the Institute's stock colony was used in these first experiments. Mice were obtained at weaning in groups of 300 (150 males and 150 females) and divided so that litter mates were equally distributed between male and female experimental and control groups. All mice were housed in individual cages (31) and given water and Purina laboratory chow *ad libitum*. All mice were observed under these conditions for one month prior to being irradiated. By this time they were fifty to sixty days old, and those that weighed 20 to 25 grams were selected for experimental work.

All irradiated mice received total body x-ray irradiation in a single exposure for a dose of 800 r (±5%). They were irradiated with the General Electric industrial x-ray unit at the Naval Gun Factory, Washington, D. C. The factors were: 1,000 kv., 3 ma., intensity of the angular beam 31.2 r/min. in air at 1 meter, h.v.l. 2.2 mm. lead. The technic of exposure has been previously described (32).

All glutathione-treated mice received two injections of this agent. Two groups received a single injection twenty-four hours before and a second injection immediately preceding irradiation. Two other groups of mice received a single injection immediately before and a single injection immediately after irradiation. The single doses of glutathione varied from 5 to 20 mg. In two groups each mouse received a total of 15 mg., and in two other groups each animal received a total of 40 mg. of glutathione.

The following experimental design was employed: There were four experiments; in each experiment mice of each sex were divided into five groups. These groups and the dosage of glutathione used in each experiment are shown in Table I (Group E not included). Group A, the non-treated controls, received 800 r of total body irradiation. Group B, the glutathione-treated group, received 800 r plus

	Experiment Number	GROUP A: Irradiation No Treatment				GROUP B: Irradiation Plus Glutathione				GROUP C: Irradiation Plus Saline				GROUP D: Glutathione No Irradiation			
		No.	Alive	Dead	% Surviving	No.	Alive	Dead	% Surviving	No.	Alive	Dead	% Surviving	No.	Alive	Dead	% Surviving
MALES	1	25	9	16	36	50	32	18	64	25	9	16	36	19	19	0	100
	2	25	4	21	16	50	22	28	44	25	8	17	32	17	17	0	100
	3	25	12	13	48	50	27	23	54	25	11	14	44	20	20	0	100
	4	25	18	7	72	50	38	12	76	25	11	14	44	20	20	0	100
TOTAL		100	43	57	43	200	119	81	59.5	100	39	61	39	76	76	0	100
FEMALES	1	25	14	11	56	50	37	13	74	25	17	8	68	7	7	0	100
	2	25	7	18	28	50	28	22	56	25	10	15	40	12	12	0	100
	3	25	6	19	24	50	32	18	64	25	12	13	48	20	20	0	100
	4	25	10	15	40	50	39	11	78	25	14	11	56	20	20	0	100
TOTAL		100	37	63	37	200	136	84	68	100	53	47	53	59	59	0	100
TOTAL Both Sexes		200	80	120	40	400	255	145	63.8	200	92	108	46	135	135	0	100

Experiments 1 and 2. Glutathione pH 2.9 5mg. in 0.1ml. Propylene Glycol. 24 hours before exposure to irradiation.
Glutathione pH 2.9 10mg. in 0.1ml. Saline Immediately before exposure to irradiation.

Experiment 3. Glutathione pH2.9 20mg. in 0.2ml. Saline Immediately before exposure to irradiation.
Glutathione pH2.9 20mg. in 0.2ml. Saline Immediately after exposure to irradiation.

Experiment 4. Glutathione pH6.0 20mg. in 0.2ml. Saline Immediately before exposure to irradiation.
Glutathione pH6.0 20mg. in 0.2ml. Saline Immediately after exposure to irradiation.

Amount of Saline injected equals that of Glutathione given in comparable groups.

Table I. Effect of various doses of glutathione upon the mortality of mice given total body irradiation (1,000 kv x-rays) for a dose of 800 r (±5%). Observation period twenty-eight days.

injections of glutathione, as indicated in the table. Each mouse of Group B in Experiments 1 and 2 received a total of 15 mg. of glutathione (60 mg. per 100 gm. of mouse). Each mouse of Group B in Experiments 3 and 4 received a total of 40 mg. of glutathione (160 mg. per 100 gm. of mouse). Group C received 800 r plus injections of isotonic saline in amounts equal to the volume of the glutathione injections. Group D received injections of glutathione, but no irradiation. Group E received no irradiation and no injections (not shown in Table I).

The glutathione and control solutions were prepared as follows: In the first experiment, for the initial injection given twenty-four hours before irradiation, glutathione was suspended in propylene glycol to act as a depot injection (5 mg. glutathione in 0.1 ml. propylene glycol). For the glutathione injections immediately before exposure to radiation in Experiment 1 and for injections immediately before and immediately after exposure to radiation in Experiments 2 and 3, glutathione was dissolved in isotonic saline to give a concentration of 100 mg. per ml. The *p*H of the glutathione-saline solution was 2.9. In Experiment 4, the glutathione solution was brought to *p*H 6.0 by adding NaOH and given in two injections, one immediately before and one immediately after irradiation. The control saline solution for each experiment was adjusted to the required *p*H with HCl. All injections were given subcutaneously in the backs of the animals, with tuberculin syringes and 22-gauge needles.

In each experiment there were 25 mice of each sex in the irradiated non-treated control groups (Group A) and also in the irradiated saline-injected control groups (Group C). There were 50 mice of each sex in the glutathione-treated group (Group B) of each experiment and 7 to 20 mice in each of the glutathione-injected non-irradiated control groups (Group D). There were 8 to 16 mice of each sex in the non-irradiated, non-treated group of each experiment (Group E).

Survival rates were obtained during the

twenty-eight days post-irradiation observation period of each experiment.

The results of the first two experiments indicated that it would be of value to study the influence of glutathione on the radiation-induced weight changes in the surviving animals. The following procedure was used to study this factor in Experiments 3 and 4:

RESULTS

Survival Data: The details of the survival of the various groups by experiment, by sex, and by combined sexes for all experiments are shown in Table I and Figure 1.

The range in survival for the irradiated non-treated male controls (Group A) was 16 to 72 per cent, with a mean survival

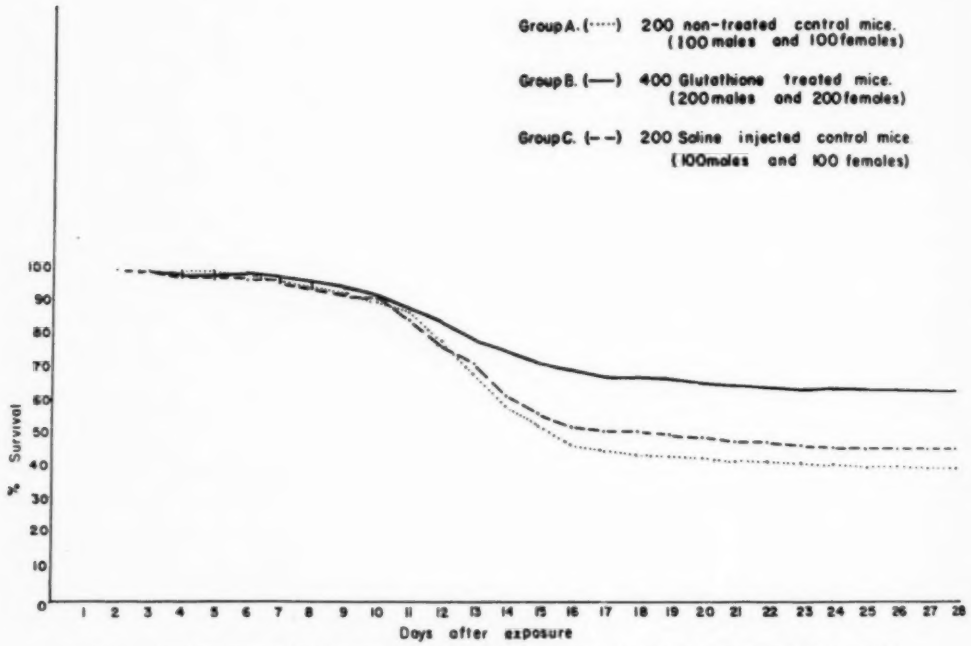
Group A. (·····) 200 non-treated control mice. (100 males and 100 females)
Group B. (——) 400 Glutathione treated mice. (200 males and 200 females)
Group C. (– –) 200 Saline injected control mice (100 males and 100 females)
% Survival
100
90
80
70
60
50
40
30
20
10
0
1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24 25 26 27 28
Days after exposure

Fig. 1. Survival curves for Groups A, B, and C (sexes pooled). All mice received 800 r ±5%.

Animals were weighed on the day of irradiation and on the seventh, fourteenth, and twenty-eighth days thereafter. The per cent of weight gained or lost by the surviving animals was then calculated (on the stated days) in terms of the weight of these survivors on zero day.

Following the twenty-eight-day observation period, differences in sensitivity to trauma were determined by use of a Noble-Collip drum (33). This latter procedure was adopted to show whether glutathione would condition surviving animals for a greater degree of subsequent trauma than the non-treated controls could tolerate.

of 43 per cent, for 100 mice. Survivals of the saline-injected irradiated male controls (Group C) varied from 32 to 44 per cent, with a mean survival of 39 per cent, for 100 mice. For the glutathione-treated irradiated males (Group B) the survival rate varied from 44 to 76 per cent, with a mean of 59.5 per cent, for 200 mice.

The survival rate of the irradiated female non-treated controls (Group A) varied from 24 to 56 per cent, with a mean of 37 per cent, for 100 mice. For female saline-injected irradiated control mice (Group C) the survival rate was from 40 to 68 per

SEX	Experiment Number		GROUP A Irradiation No treatment				GROUP B Irradiation Plus Glutathione				GROUP C Irradiation Plus Saline				GROUP D No Irradiation Glutathione				GROUP E No Irradiation No treatment			
		Days after X-ray	0	7	14	28	0	7	14	28	0	7	14	28	0	7	14	28	0	7	14	28
MALES	3	Number of Survivors	25	25	13	12	50	47	32	27	25	25	15	11	20	20	20	20	12	12	12	12
		Average weight in grams	23.2	22.2	21.2	24.9	24.4	24.6	23.9	28.0	23.1	22.6	20.9	24.9	24.8	25.7	27.7	28.0	25.3	26.7	28.6	30.1
		% Change in weight		-4.3	-8.6	+7.3		+0.8	-2.0	+14.8		-2.2	-9.5	+7.8		+3.6	+11.7	+12.9		+5.5	+13.0	+19.0
	4	Number of Survivors	25	25	20	18	50	50	41	38	25	24	13	11	20	20	20	20	16	16	16	16
		Average weight in grams	25.3	23.2	23.1	24.9	26.2	26.0	25.4	28.5	26.2	25.7	24.9	30.1	25.7	26.9	28.6	30.7	21.7	23.0	24.6	25.3
		% Change in weight		-8.3	-8.7	-1.6		-0.8	-3.1	+8.8		-1.9	-5.0	+14.9		+4.7	+11.3	+19.5		+6.0	+13.4	+16.6
FEMALES	3	Number of Survivors	25	24	12	6	50	50	38	32	25	25	17	12	20	20	20	20	12	12	12	12
		Average weight in grams	23.8	19.5	17.9	22.4	24.7	20.2	20.3	23.6	25.2	20.2	19.5	22.7	21.4	21.9	23.0	24.3	23.6	24.6	25.9	27.4
		% Change in weight		-18.1	-24.8	-5.9		-18.2	-17.8	-4.5		-19.8	-22.6	-9.9		+2.3	+7.5	+13.6		+4.2	+9.7	+16.1
	4	Number of Survivors	25	25	16	10	50	50	45	39	25	25	17	14	20	20	20	20	8	8	8	8
		Average weight in grams	20.5	19.5	17.9	21.0	22.2	22.1	21.2	24.1	22.4	21.3	21.4	24.1	21.6	23.8	23.2	24.4	20.3	22.1	22.8	24.8
		% Change in weight		-4.9	-12.7	+2.4		-0.5	-4.5	+8.6		-4.9	-4.5	+7.6		+10.2	+7.4	+13.0		+8.9	+12.3	+22.2

Table II. Effect of glutathione administration on the weight of mice receiving 1,000-kv. roentgen irradiation for a dose of 800 r ($\pm 5\%$).

cent, with a mean of 53 per cent, for 100 mice. Female glutathione-treated irradiated mice (Group B) showed 56 to 78 per cent survival, with a mean survival of 68 per cent, for 200 mice.

When both sexes are pooled, the over-all survival of the 400 irradiated mice treated with glutathione is 63.8 per cent as compared with a survival of 40 per cent for 200 irradiated non-treated control mice and 46 per cent for 200 irradiated saline-injected control mice. Despite the large variation in survival of the control irradiated mice of both sexes, *in every case* the glutathione-treated animals showed a definitely greater survival rate than their comparable control groups.

When the above results were compared statistically, no significant difference was found between the irradiated non-treated controls (Group A) and the irradiated saline-injected controls (Group C).

$$[X^2_{taf} = 1.23\ (0.30 > p > 0.20)]$$

Consequently, the results of these two groups (A and C) were combined and compared with Group B (the irradiated glutathione-treated animals). The Chi-square in this case was found to be 33.77, which yields a probability of much less than 0.001.

Figure 1 shows the orderly survival curves for the three irradiated groups with the mortalities combined for the males and females of each group. Deaths began in all three groups between the third and sixth days after irradiation and stopped by the twenty-second day. The greatest number of deaths occurred between the tenth and sixteenth days.

Weight Changes: The data on weight changes are summarized in Table II, inspection of which reveals that the non-irradiated mice in Groups D and E gained weight progressively throughout the twenty-eight-day observation period, while the irradiated mice in Groups A and C showed a marked weight loss for the first

Sex	Groups E, A, & B	Number of mice	Per cent mortality
MALES	Control (no x-ray)	174	41.7
	Control (800r)	65	77.4
	Glutathione treated (800r)	116	57.0
FEMALES	Control (no x-ray)	185	30.6
	Control (800r)	63	78.4
	Glutathione treated (800r)	135	69.9

Table III. Mortality data for mice traumatized in Noble-Collip drum.

fourteen days. It is of interest to note that, although the irradiated glutathione-treated survivors (Group B) showed this same trend in weight loss, they had definitely lost less weight by the fourteenth day than had the survivors of either of the irradiated control groups. These findings were in agreement with the above data on survival rates, and it appeared that recuperation was somewhat favored in the glutathione-treated animals.

Observations on Trauma: (*a*) *Local effect of glutathione:* It was observed that in Experiments 2 and 3, apparently as a result of the low *p*H (2.9) and the high alkaline-combining power of the glutathione, local necrosis was produced at the site of injection in about 70 per cent of the treated mice. Cutaneous sloughs as large as 2 cm. in diameter appeared in both the irradiated and non-irradiated animals receiving glutathione. There was no difference in the appearance or the healing time of the sloughs in the surviving irradiated and non-irradiated mice, and, despite these sloughs, the glutathione-treated mice had a greater survival than the non-treated irradiated controls. The ulcers remained dry after the sloughs occurred and healed rapidly. Figure 2 shows the size of these ulcers and the degree of healing evident within the twenty-eight-day observation period. With the small dose of glutathione used in Experiment 1 (10 mg. in 0.1 ml. saline), sloughs did not occur, nor were they observed in Experiment 4, with the buffered glutathione solution.

These observations on the effect of trauma in irradiated mice were incidental findings. A more careful study of trauma was made, using the Noble-Collip drum.

(*b*) *Effect of controlled trauma:* Table III shows the results obtained when the surviving irradiated glutathione-treated mice and the surviving irradiated and non-irradiated controls were subjected to controlled trauma in the Noble-Collip drum at the end of the twenty-eight-day

post-irradiation observation period. In each instance the mortality from trauma was greater among the irradiated mice than among the non-irradiated controls and was lower among the glutathione-treated irradiated mice than among the irradiated non-treated mice. The P value is between 0.05 and 0.1 for the irradiated controls as compared with the irradiated glutathione-treated animals.

DISCUSSION

In four consecutive experiments involving a total of 800 male and female mice, glutathione increased the survival rate from 4 per cent to 38 per cent, with an average increase in survival of 20.8 per cent (glutathione-treated group compared with the average combined totals of the two irradiated control groups). Statistically, this is definitely significant. Of even greater significance is the fact that the glutathione-treated animals lost much less weight and were able to regain their lost weight more rapidly than the control animals. In Experiments 2 and 3, the relatively large doses of non-buffered glutathione produced large ulcers, which were healed by the end of the twenty-eight-day observation period. This was especially interesting because the ulcerations healed during a time when granulocytes were probably very few in number. However, mouse skin is notably resistant to bacterial infection, and, in this species, local tissue resistance is perhaps of more importance than granulocytes in preventing infection. In addition, the data thus far collected by traumatizing mice in the Noble-Collip drum suggest that the irradiated animals treated with glutathione are more resistant to subsequent trauma than are irradiated non-treated survivors. The results obtained from this latter phase of the experiment, however, are not yet statistically reliable, due to the small numbers of animals involved.

The mechanisms of the action of glutathione in producing the above beneficial effects after exposure to a single dose of radiation remain obscure. One can theorize in accord with the views of Barron (3–6) that glutathione, in the large doses used in these experiments, may protect the sensitive —SH groups of certain enzymes. This action may increase the survival and minimize the tissue destruction and weight loss which follow irradiation. Such a view, however, would certainly be untenable unless it is proved: (*a*) that the enzyme activity is inhibited in tissue slices removed from animals

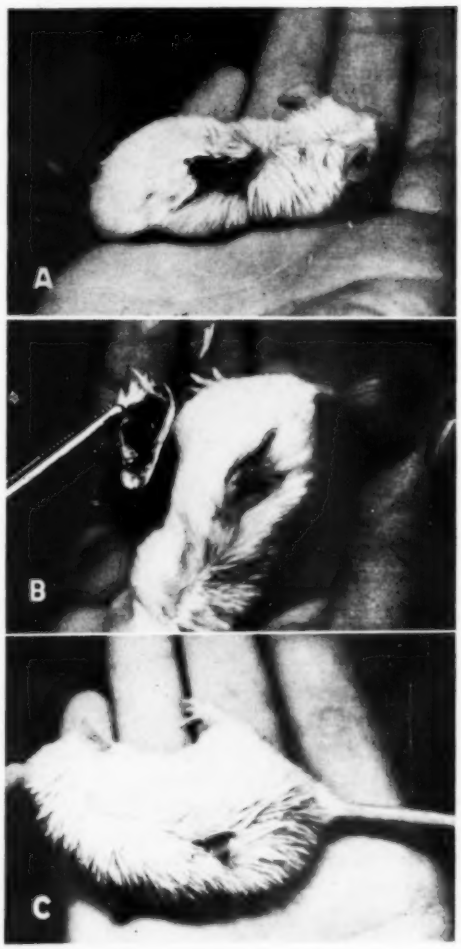

Fig. 2. A. Typical ulcer in an irradiated mouse approximately seven days following injection of non-buffered glutathione.

B. Ten days later. Typical appearance of partially healed ulcer with slough occurring from this site.

C. Typical appearance of healed ulcer twenty-eight days after irradiation.

previously irradiated and (*b*) that glutathione prevents this inhibition. It remains the opinion of the authors that the cause of the *apparent* beneficial effects of glutathione remains obscure and that only by systematic biochemical and histologic studies on irradiated animals, both with and without glutathione treatment, will the mechanism of its action be elucidated.

The presently available evidence suggests that glutathione treatment favorably influences the course of radiation illness. However, to clarify its effects as much as possible, it is necessary to experiment with large numbers of animals of different species over the entire lethal dose range (31, 32, 34). The results of the first phase of the study have been presented in this report. Patt *et al* (35) have recently published data that demonstrate the marked protective effect of pre-irradiation administration of another sulfhydryl compound, cysteine hydrochloride, in rats.

SUMMARY AND CONCLUSIONS

1. Male and female mice were exposed to total body x-ray irradiation, in doses of 800 r. Four hundred were given glutathione *before* or both *before and after* irradiation. Two hundred were given control saline injections, and 200 received no treatment.

2. The survival rates of the glutathione-treated groups were greater (63.8 per cent) than the survival rates for the comparable control groups (40 to 46 per cent). Statistical analysis showed that the differences in survival rates were definitely significant.

3. The surviving glutathione-treated irradiated animals lost less weight and recovered weight more rapidly than the surviving irradiated control animals.

4. Glutathione-treated survivors, when traumatized, had a lower mortality than the non-treated controls.

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REFERENCES

1. LEA, D. E.: Actions of Radiations on Living Cells. New York, Macmillan Co., 1947, p. 40.
2. DAINTON, F. S.: On the Existence of Free Atoms and Radicals in Water and Aqueous Solutions Subjected to Ionizing Radiations. J. Phys. & Colloid Chem. **52:** 490–517, March 1948.
3. BARRON, E. S. G.: Some Aspects of the Biological Effects of Radiation. U. S. Atomic Energy Commission Document MDDC-484. Technical Information Division, Oak Ridge, Tenn., 1946.
4. BARRON, E. S. G., DICKMAN, S. R., AND SINGER, T. P.: Feder. Proc. Soc. Biol. Chem. **6:** 1, 1947.
5. BARRON, E. S. G., DICKMAN, S. R., MUNTZ, J. A., AND SINGER, T. P.: Studies on the Mechanism of Action of Ionizing Radiations. I. Inhibition of Enzymes by X-rays. J. Gen. Physiol. **32:** 537–552, March 20, 1949.
6. BARRON, E. S. G., AND DICKMAN, S. R.: Studies on the Mechanism of Action of Ionizing Radiations. II. Inhibition of Sulfhydryl Enzymes by Alpha, Beta, and Gamma Rays. J. Gen. Physiol. **32:** 595–605, May 20, 1949.
7. PARPART, A. K.: The Chemistry of Physiology and Growth. Princeton, N. J., Princeton University Press, 1949, pp. 106–134.
8. SHIRAI, M.: Treatment of Roentgen Intoxication by Glutathione Preparations. Nagoya Igakkai Zassi (J. Nagoya M. A.) (Mitt. med. Gesell., Nagoya) **54:** 183–192, 1941.
9. NORD, F. F., AND WERKMAN, C. H., editors: Advances in Enzymology. New York, Interscience Publishers, Inc., 1945, Vol. 5, pp. 237–247.
10. ELVEHJEM, C. A., WILSON, P. W., ET AL.: Respiratory Enzymes. Minneapolis, Burgess Publishing Co., 1942, pp. 125–129.
11. HELLERMAN, L.: Reversible Inactivation of Certain Hydrolytic Enzymes. Physiol. Rev. **17:** 454–484, July 1937.
12. BEST, C. H., AND TAYLOR, N. B.: The Physiological Basis of Medical Practice. Baltimore, Williams and Wilkins Co., 4th ed., 1945, p. 331.
13. VOEGTLIN, C.: Observations Concerning the Chemistry of Cell Growth and Division. Cold Spring Harbor Symp., Quant. Biol. **2:** 84–89, 1934.
14. HAMMETT, F. S.: Natural Chemical Factors in Growth and Development. Cold Spring Harbor Symp., Quant. Biol. **2:** 78–83, 1934.
15. HAMMETT, F. S.: Possible Explanation of Function of Glutathione in Developmental Growth. Science **79:** 457, May 18, 1934.
16. RAPKINE, L.: Sur les processus chimiques au cours de la division cellulaire. Ann. de physiol. **7:** 382–418, 1931.
17. BARRON, E. S. G., AND SINGER, T. P.: Studies on Biological Oxidations. Sulfhydryl Enzymes in Carbohydrate Metabolism. J. Biol. Chem. **157:** 221–240, 1945.
18. SINGER, T. P., AND BARRON, E. S. G.: Studies on Biological Oxidations. Sulfhydryl Enzymes in Fat and Protein Metabolism. J. Biol. Chem. **157:** 241–253, January 1945.
19. CHALKLEY, H. W.: Amoeba proteus as Material for the Study of Cell Division and Cell Growth. Cold Spring Harbor Symp., Quant. Biol. **2:** 89–93, 1934.
20. GREGORY, P. W., AND GOSS, H.: Glutathione Concentration and Hereditary Body Size. J. Exper. Zool. **66:** 155–173, Aug. 5, 1933.
21. HAMMETT, F. S.: An Interpretation of Malignant Growth Based on the Chemistry of Cell Division. Arch. Path. **8:** 575–594, October 1929.
22. GOERNER, A., AND GOERNER, M. M.: Metabolism of Sulfhydril Compounds in Tumor Tissue. Am. J. Cancer **16:** 360–365, March 1932.

23. BOYLAND, E.: A Note on Glutathione and Vitamin C in Tumour Tissue. Biochem. J. **27:** 802–805, 1933.

24. BIRCH, T. W., AND DANN, W. J.: Estimation and Distribution of Ascorbic Acid (Vitamin C) and Glutathione in Animal Tissues. Nature **131:** 469–470, April 1, 1933.

25. ROWNTREE, L. G., CLARK, J. H., AND HANSON, A. M.: Biologic Effects of Thymus Extract. Accruing Acceleration in Growth and Development in Five Successive Generations of Rats under Continuous Treatment with Thymus Extract. Arch. Int. Med. **56:** 1–29, July 1935.

26. ROWNTREE, L. G., STEINBERG, A., EINHORN, N. H., AND SCHAFFER, N. K.: Certain Iodine-Reducing Substances of Thymus Extract. Biological Considerations. Endocrinology **23:** 584–592, November 1938.

27. SCHAFFER, N. K., ZIEGLER, W. M., AND ROWNTREE, L. G.: Certain Iodine-Reducing Substances of Thymus Extract. Chemical Analysis of Extract. Endocrinology **23:** 593–597, November 1938.

28. SCHAFFER, N. K., AND ZIEGLER, W. M.: Isolation of Glutathione from Thymus Glands. Proc. Soc. Exper. Biol. & Med. **42:** 93–94, October 1939.

29. SHERROD, T. R., AND STRUCK, H. C.: Study of Four Generations of Rats Treated with Large Amounts of Glutathione. Growth **7:** 11–15, March 1943.

30. ASTRUP, T., AND FISCHER, A.: Protein Metabolism of Tissue Cells in Vitro. Properties of Malt Extracts and Glutathione as Accessory Growth Substances. Acta physiol. Scandinav. **11:** 187–196, 1946.

31. CRONKITE, E. P., CHAPMAN, W. H., SIPE, C. R., ELTZHOLTZ, D. C., AND CHAMBERS, F. W., JR.: Lethal Dose Studies on Mice with 1.0 Mev X-ray. In preparation.

32. CHAPMAN, W. H., SIPE, C. R., ELTZHOLTZ, D. C., CRONKITE, E. P., LAWRENCE, G. H., AND CHAMBERS, F. W., JR.: Method for the Simultaneous Exposure of Large Numbers of Animals to Single Dose High Intensity Whole Body X-Ray Radiation. Nav. M. Research Inst., Project NM 007 039, Report No. 14, August 1948.

33. NOBLE, R. L., AND COLLIP, J. B.: Quantitative Method for the Production of Experimental Traumatic Shock Without Haemorrhage in Unanesthetized Animals. Quart. J. Exper. Physiol. **31:** 187–199, February 1942.

34. CLARK, W. G., AND UNCAPHER, R. P.: Dosage-Mortality in Rats Given Total Body Roentgen Irradiation. Proc. Soc. Exper. Biol. & Med. **71:** 214–216, June 1949.

35. PATT, H. M., TYREE, E. B., STRAUBE, R. L., AND SMITH, D. E. Cysteine Protection Against X-Irradiation. Science **110:** 213–214, August 1949.

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SUMARIO

Los Agentes Sulfhidrílicos y los Efectos de las Radiaciones Yonizantes. I. Efecto Beneficioso de la Inyeccion de Glutaniona sobre la Mortalidad y la Pérdida de Peso Evocadas por los Rayos X en los Ratones

Como parte de una investigación encaminada a determinar el efecto de los compuestos sulfhidrílicos sobre la evolución de la enfermedad postirradiatoria, los AA. presentan un estudio de los efectos de la glutaniona sobre los ratones irradiados.

Ratones de ambos sexos fueron expuestos a la irradiación total del cuerpo con rayos X, a dosis de 800 r. Cuatrocientos ratones recibieron glutaniona *antes* o *tanto antes como después* de la irradiación, 200 recibieron inyecciones salinas como testigo y 200 no recibieron tratamiento alguno.

Las tasas de sobrevivencia fueron mayores (63.8 por ciento) en los grupos tratados con glutaniona que en los grupos testigos comparables (40 a 46 por ciento). El análisis estadístico demostró que las diferencias en las tasas de sobrevivencia eran claramente significativas.

Los animales irradiados tratados con glutaniona que sobrevivieron perdieron menos peso y recobraron el perdido más rápidamente que los testigos sobrevivientes. Los sobrevivientes tratados con glutaniona, al ser traumatizados, mostraron una mortalidad menor que los testigos no tratados.

The Combined Effect of a Tumor Inhibitor (5-amino 7-hydroxy-1 H-V-triazolo (d) pyrimidine) and X-Ray Therapy[1]

I. W. J. CARPENDER, M.D., and RAYMOND R. LANIER, Ph.D., M.D.

THE SUCCESS OF irradiation in cancer therapy is dependent in most instances on the differential sensitivity of cancer cells as compared to the cells of normal surrounding tissue. Too often this differential is so small that adequate irradiation is impossible. The exact mode of action of ionizing radiation, when successful, and the time of such action with respect to the phases of cell division are not definitely known, although these problems have been the subject of extensive investigations.

The recent work of Kidder and associates (1), showing that guanazolo (5-amino 7-hydroxy-1 H-V-triazolo (d) pyrimidine) inhibits guanine metabolism in certain lower organisms and in tumors where guanine is an essential metabolite for growth, suggested to us that a study of the effect of ionizing radiation in tumors so inhibited might yield some worth-while information. At the outset, it was realized that there were three possible results to be expected:

(1) There would be no change in the effectiveness of radiation.

(2) The radiation effect would be enhanced.

(3) Radiation would be less effective.

As a corollary to (2) and (3), it is obvious that information would be gained concerning the advisability of giving tumor growth inhibitors during x-ray or radium therapy for cancer. Also, evidence would be added as to whether active cellular division or growth is necessary for effective irradiation therapy.

MATERIALS AND METHODS

Since Kidder and associates demonstrated such excellent results using mammary tumor E0771 in C57 Black mice, it was decided to use the same tumor and host to duplicate the conditions of their experiment. The tumors were implanted subcutaneously on the lower lateral aspect of the left leg in mice five to six weeks old.[2]

The inoculum was prepared under sterile technic by grinding 3 c.c. of fresh tumor in 9 c.c. of normal saline to which 10,000 units of penicillin were added. The cellular suspension was fine enough to pass through a 20-gauge needle. Each mouse received 0.05 c.c. of the inoculum.

One week after inoculation, mice having tumors approximately 0.5 cm. in diameter were selected, and daily injections of 1.0 mg. of guanazolo were begun in two groups. On the following day one of the above groups and an additional group were started on a course of x-ray treatments.

In order to protect the mice from the harmful effects of total body irradiation, individual boxes were prepared with 0.25 in. of lead on each of the six sides. Into these a mouse could be placed with only the leg and tumor exposed. The leg was fixed by a sliding door and held extended by a tie around the foot, pinned to a wooden turntable (Fig. 1).

Measurements were made of the daily tumor dose by a Victoreen condenser r-meter in the position occupied by tumor-bearing tissue. Consequently, scatter from the turntable and adjacent lead housing was measured. Measurements made within the lead box, with wax to simulate the mouse, indicated a body exposure of approximately 2.2 per cent of the total tumor dose.[3]

The treatment factors were 200 kv.p., 20 ma., 50 cm. F.S.D., 0.5 mm. Cu and 1 mm. Al filtration, h.v.l. 0.9 mm. Cu.

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[1] From the Section of Radiology, University of Chicago, Chicago, Ill. Accepted for publication in May 1950. This work was supported in part by an Institutional Grant from the American Cancer Society.

[2] The mice and the tumors were obtained from the Jackson Memorial Laboratories, Bar Harbor, Maine.

[3] We are indebted to Dr. Lester Skaggs, Physicist for the Section of Radiology, for his aid in dosage calculations.

Sixteen tumors were simultaneously irradiated. The lead boxes were arranged at the periphery of the turntable disk, which rotated in the x-ray field approximately eight times per minute to insure uniform treatment. The central ray was directed at the axis of rotation of the disk. The daily dosages were begun at 200 r and increased to as much as 600 r. The total dose given the tumors was 4,600 r in fourteen days.

RESULTS

The growth of the transplanted mammary tumors was roughly graded each day, "plus" indicating a definite increase in size, "plus-minus" no change, and "minus" a decrease in size. The tumors grew rapidly and continuously in the untreated control group, and 6 of the 15 mice in this group died with very large tumors before the experiment was completed. Two were killed for histologic study in the first week, leaving 7 survivors at the end of fourteen days. The average weight of the untreated tumors in this group was 2.56 gm. The average weight of these mice without their tumors was 19.3 gm.

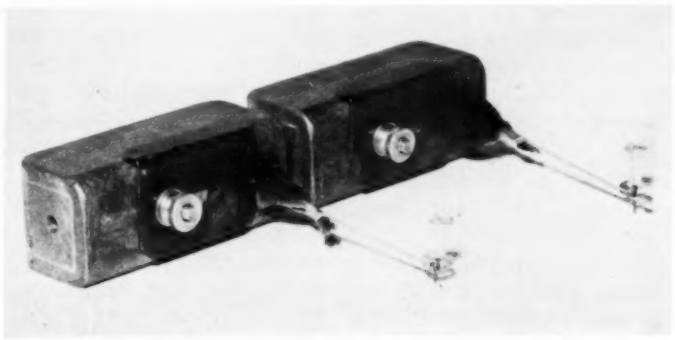

Fig. 1. Lead container and method of preparing tumor area for irradiation. Left: Normal mouse. Right: Mouse with transplanted tumor.

Four groups of tumor-bearing mice were used. Fifteen were set aside as untreated controls; 32 were given 1 mg. guanazolo subcutaneously each day; 32 were given x-ray treatment daily; 48 mice received both guanazolo and x-ray treatment.

At intervals during the experiment mice were taken from each group for histologic comparison of the tumors. Tumor samples were fixed in 70 per cent alcohol-10 per cent formalin solution and embedded in paraffin; sections were stained with chromium hematoxylin and hematoxylin-eosin-azure (Maximow stain).

At the end of the fourteen-day treatment period, the mice remaining were killed (with a few exceptions set aside for future observation). The carcasses, including the tumor, were weighed and the tumors were then weighed separately. Tumor weights include remnants of invaded muscle and tibia and fibula, since these could not be separated. Finally, portions of the tumors were taken for histologic study.

In the group given guanazolo alone, tumor growth was steadily progressive, with no discernible difference between growth rate in this group and the untreated controls. Only 4 of these 32 mice succumbed, however, before the end of the full treatment period, as compared to the high mortality in the untreated group. Six of the mice given guanazolo alone were killed during the treatment interval. Six others were set aside at the end for observation, leaving 16 for comparison after fourteen days of treatment. The average tumor weight in this group was 3.97 gm., and the mice without tumors had an average weight of 14.76 gm.

Thirty-two mice were treated with x-rays alone. Their tumors grew slowly until the tumor dose reached 1,800 r, after

TABLE I: EXPERIMENTAL RESULTS

	No. Mice	Means and Standard Error of the Mean	Standard Deviation	Median	Range
Mouse weights (gm.)					
Guanazolo	16	14.76 ± 0.37	1.48	15.0	11.9–16.8
X-ray	20	19.22 ± 0.57	2.55	19.0	14.4–26.0
Guanazolo + x-ray	27	15.75 ± 0.33	1.73	16.1	11.4–18.6
Control*	7	19.30 ± 1.08	2.86	18.6	15.8–24.3
Tumor weights (gm.)					
Guanazolo	16	3.97 ± 0.33	1.33	3.62	1.7–6.4
X-ray	20	1.76 ± 0.19	0.85	1.88	0.15–3.4
Guanazolo + x-ray	27	0.84 ± 0.08	0.42	0.70	0.10–1.7
Control*	7	2.56 ± 0.50	1.33	2.1	1.0–4.9

* Data on this group excluded from further analysis. See text.

which there was no further increase in tumor size. Six of this group were killed for histologic study during the course; 6 were spared after fourteen days, leaving 20 for weight analysis at the conclusion of the treatment interval. There were no tumor deaths in this group. The average tumor weight was 1.76 gm.; average mouse weight without tumor, 19.22 gm.

In the 48 mice given both x-ray irradiation and guanazolo, the transplanted tumors grew less than in any other group, and growth ceased after the second day of treatment. Three of the group died during the course of the experiment. Seven were studied histologically in the course, and 11 were spared, leaving 27 for weight comparison. The average tumor weight was 0.84 gm., mouse weight without tumor, 15.75 gm., at the end of two weeks.

The statistical comparison of the groups at the end of the three weeks study is given in Tables I, II, and III. The differences in tumor weights in the three treated groups are statistically significant as indicated by the "t" values. There was no general correlation between tumor and mouse weight.

The results of the histologic study of the tumors in specimens taken during and at the end of the experiment are non-contributory. All specimens showed active tumor regardless of treatment and size. Tumors from the guanazolo-treated animals could not be distinguished from those of the untreated controls. Differences in tumor architecture and nuclear and cytoplasmic distinctions were not apparent. There was no obvious reduction in the number of mitoses, although detailed counts were not attempted. In the groups receiving x-ray therapy, the classic damage due to irradiation was encountered, and the addition of guanazolo did not change the histologic picture recognizably.[4]

In the mice observed after the end of treatment, there were no cures. Further growth of tumors was most rapid in the group which had received guanazolo, and least rapid and longest postponed in the group which had the combined treatments.

DISCUSSION

The 40 per cent mortality in the group of untreated controls, in the three weeks after tumor inoculation, removed from that group the largest tumors. The average tumor weight of the 7 survivors cannot, therefore, be compared reasonably with the other groups. Full-time survival in the experimental interval indicates a favorable effect of the guanazolo, although tumor growth was not arrested as we expected it to be from Kidder's report.

Recently Sugiura and his colleagues (2) have shown little or no effect of guanazolo in preventing growth of transplanted E0771 carcinoma in C57 Black mice if treatments are delayed for six days after inoculation. Our results are in accord with this report.

Results as to the effectiveness of x-ray treatment of transplanted mouse mammary carcinoma are confirmed by our experience. That these tumors can be eradi-

[4] We are indebted to Drs. Paul Steiner and Eleanor Humphreys, Department of Pathology, for help in the study of our sections.

TABLE II: "t" TESTS OF SIGNIFICANCE OF DIFFERENCES OF MEANS

	"t"	Deg. of Freedom	From "t" Tables*
Mouse weights (gm.)			
X-ray *vs.* guanazolo	6.19	34	$t_{0.001} = 3.60$
Guanazolo + x-ray *vs.* guanazolo	1.91	41	$t_{0.05} = 2.02$
X-ray *vs.* guanazolo + x-ray	5.55	45	$t_{0.001} = 3.52$
Tumor weights (gm.)			
Guanazolo *vs.* x-ray	6.06	34	$t_{0.001} = 3.60$
Guanazolo *vs.* guanazolo + x-ray	11.39	41	$t_{0.001} = 3.54$
X-ray *vs.* guanazolo + x-ray	4.92	45	$t_{0.001} = 3.52$

*Fisher, Ronald, A., and Yates, Frank: Statistical Tables for Biological, Agricultural, and Medical Research. New York, Hafner Publishing Co. Inc., Rev. ed., 1948.

cated by this means has been demonstrated by Oughterson and his colleagues (3) and by Goldfeder (5). The latter found that much higher doses were required for cures than were attempted by us for our experiment. The maximum dose in the present investigation, 4,600 r in fourteen days, failed to produce a single cure in the animals observed after the experimental period. In future investigation we hope to determine the effects of guanazolo at tumor-lethal dose levels.

This preliminary study indicates a synergistic effect between x-ray and guanazolo. The mechanism of this effect will be the object of future study; it is unknown to us at this time. The response to treatment by x-rays at the time of action of a tumor growth inhibitor indicates to us that cells need not be actively dividing in order to be susceptible to radiation effects. This is further borne out by Goldfeder, who found no correlation between the histological appearance of a tumor and its response to irradiation. Brues (5) and associates have also described the lack of correlation between the inhibition of mitosis by maximal sublethal doses of colchicine and x-ray therapy.

In clinical experience a beneficial effect has been observed (6) in the treatment of Hodgkin's disease by alternate use of nitrogen mustard and x-rays in some cases. The explanation of this effect is also unknown. It is undoubtedly different from the reasons for the better results of x-ray treatment in patients given colloidal lead orthophosphate, as described by Reynolds and his colleagues (7).

All of these methods, however, indicate an approach to the problem of irradiation therapy that deserves wide exploration. Every hormone, tumor toxin, or chemical inhibitor should be tried with radiation therapy in the hope that the effectiveness of each will be increased by increasing the differential between the malignant cell and its normal environment.

TABLE III: TEST FOR CORRELATION BETWEEN NET MOUSE WEIGHT AND TUMOR WEIGHT

Treatment	No. Mice	Correlation Coefficient
Guanazolo	16	0.110
X-ray	20	0.126
X-ray + guanazolo	27	−0.231
Control	7	−0.324

SUMMARY

Groups of C57 Black mice bearing transplanted E0771 adenocarcinoma were treated with guanazolo only, with x-rays only, and with guanazolo plus x-rays. Treatment with guanazolo alone, seven days after tumor inoculation, failed to arrest growth of the tumor, but tumors treated with both guanazolo and x-rays were smaller than those treated by either x-rays alone or guanazolo alone. The mechanism of this effect is unknown at present. Future studies are planned using guanazolo and other tumor inhibitors.

ACKNOWLEDGMENT: We express our appreciation to the Lederle Laboratories, Division of the American Cyanamid Company, who generously provided the guanazolo used in this experiment, and to Professor W. Allen Wallis of the School of Business, the University of Chicago, and his colleagues for assistance in preparing the statistical tables.

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REFERENCES

1. KIDDER, G. W., DEWEY, V. C., PARKS, R. E., AND WOODSIDE, G. L.: Purine Metabolism in Tetrahymena and Its Relation to Malignant Cells in Mice. Science **109:** 511–514, May 20, 1949.
2. SUGIURA, K., HITCHINGS, G. H., CAVALIERI, L. F., AND STOCK, C. C.: Effect of 8-Azaguanine on the Growth of Carcinoma, Sarcoma, Osteogenic Sarcoma, Lymphosarcoma and Melanoma in Animals. Cancer Research **10:** 178–185, March 1950.
3. OUGHTERSON, A. W., TENNANT, R., AND LAWRENCE, E. A.: Tumor Response and Stroma Reaction Following X-Ray of a Transplantable Tumor in Inbred Strains of Mice. Yale J. Biol. & Med. **12:** 419–425 March 1940.
4. GOLDFEDER, A.: Further Studies on the Relation Between Radiation Effects, Cell Viability, and Induced Resistance to Malignant Growth. VI. Anomalous Radiosensitivities of Analogous Mouse Mammary Adenocarcinomas. Radiology **54:** 93–115, January 1950.
5. BRUES, A. M., MARBLE, B. B., AND JACKSON, E. B.: Effects of Colchicine and Radiation on Growth of Normal Tissues and Tumors. Am. J. Cancer **38:** 159–168, February 1940.
6. GOODMAN, L. S., ET AL.: Nitrogen Mustard Therapy. Use of Methyl-bis (β-chloroethyl) Amine Hydrochloride and Tris (β-chloroethyl) Amine Hydrochloride for Hodgkin's Disease, Lymphosarcoma, Leukemia and Certain Allied and Miscellaneous Disorders. J. A. M. A. **132:** 126–132, Sept. 21, 1946.
7. REYNOLDS, L., LEUCUTIA, T., COOK, J. C., AND CORRIGAN, K. E.: Colloidal Lead Orthophosphate Associated with Deep Roentgen Therapy in Bone Metastases from Cancer of the Breast. Am. J. Roentgenol. **60:** 193–206, August 1948.

SUMARIO

El Efecto Combinado de un Inhibidor de Tumores (5-amino 7-hidroxi-1 H-V-triazolo (d) pirimidina) y de la Roentgenoterapia

Grupos de ratones negros C57 con transplantes de adenocarcinoma (E0771) fueron tratados con inyecciones diarias de guanazolo (5-amino 7-hidroxi-1 H-V triazolo (d) pirimidina) solo, rayos X solos y guanazolo con rayos X. El tratamiento con guanazolo solo, después de un plazo de siete días de desarrollo del tumor, no impidió el desarrollo subsiguiente del mismo. Los tumores tratados exclusivamente con la irradiación se desarrollaron lentamente hasta que se llegó a una dosis de 1,800 r, después de lo cual no hubo más aumento del tamaño. La irradiación combinada con el guanazolo hizo cesar el desarrollo de los tumores después del segundo día de tratamiento y los tumores tratados eran más pequeños que los tratados con uno u otro agente por sí solo. Se desconoce todavía el mecanismo de este efecto sinérgico. Proyéctanse nuevos estudios en que se usarán el guanazolo y otros inhibidores de tumores.

Protective Action of Anoxic Anoxia Against Total Body Roentgen Irradiation of Mammals[1]

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A NUMBER OF EXPERIMENTS have been carried out which indicate that a reduction in oxygen tension reduces irradiation injury in mammals (1, 2, 4), plants (3, 7, 8), yeast (6), and in tissue cultures (5). In mammals, reduced irradiation injury has been demonstrated in cases where the circulation has been impaired (1, 4) by strapping the chests of day-old rats (4), in poorly vascularized tumors (9), and in severe anemia (2). The interpretation and evaluation of each of these experiments are complicated by the presence of several variables. For example, in the experiments in which the circulation of a limb or tail was blocked, other essential metabolites, as well as oxygen, failed to reach the cells. Also, carbon dioxide and other products could not be removed from the cells. In the chest-strapping experiments, the degree of anoxia is unknown, and in the anemia experiments, likewise, secondary responses other than anoxia could have taken place. When all the experiments are considered as a group, however, they have one common factor, namely, reduced oxygen tension.

In the plant pollen, tissue culture, and yeast experiments, no circulation is involved. Therefore, anaerobiosis must protect either by its effect on metabolism or by blocking certain radiochemical reactions in which oxygen is necessary.

In the studies to be reported here, the effect of extreme anoxic anoxia of brief duration on the LD 50 and on the radiation syndrome observed in mammals after total-body roentgen irradiation has been investigated. By using a brief period of anoxia, it was hoped to avoid any variables caused by the secondary reactions due to anoxia alone. It was observed that anoxia gave a high degree of protection from lethal roentgen irradiation and ameliorated the clinical picture.

MATERIALS AND METHODS

In these studies, male and female rats (average weight, 170 gm.) of a Wistar strain were used. The rats were maintained on a diet of Rockland rat chow and given water *ad libitum*. After irradiation, aureomycin, 25 mg. per cent, was added to the drinking water. Growth curves and clinical appearances were noted for each rat for a period of ten days before irradiation and thirty-five days post irradiation. The rats were irradiated one at a time in an air-tight leucite chamber (10 × 10 × 5 cm.). The gas mixtures from commercial cylinders were bubbled through water and entered the chamber through 1/4-inch tubing. The gas escaped from the chamber through a 1-foot length of 1/4-inch tubing. The effluent gas was checked for its oxygen content with a Beckman oximeter. The gases were flushed through the chamber for approximately ninety seconds before irradiation to bring about their equilibration and to allow the rats to become anoxic. A continuous flow of gases was maintained during irradiation. The anoxic anoxia rats were irradiated in a mixture of 5 per cent oxygen and 95 per cent nitrogen. The control rats were irradiated under the same conditions except that a mixture of 20 per cent oxygen and 80 per cent nitrogen was flushed through the chamber. Alternate anoxic and control animals were irradiated. The rats were in the chamber approximately eight minutes and were removed into air immediately after irradiation.

[1] From the Medical School of the University of California at Los Angeles. This paper is based on work performed under Contract No. AT-04-1-GEN-12 between the Atomic Energy Commission and the University of California at Los Angeles. Accepted for publication in January 1950.

TABLE I: EFFECT OF ANOXIA ON THE SURVIVAL OF RATS AT VARYING DOSES OF ROENTGEN RADIATION

Dose	O_2	No. of Rats	Number Surviving One to Thirty Days																							Survivors
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	25	30	
600 r	5%	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	44	100%
	20%	43	43	43	43	43	43	43	43	42	41	40	35	33	33	33	33	32	30	29	29	29	29	28	27	63%
800 r	5%	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	39	100%
	20%	40	40	40	40	36	25	23	19	13	7	5	2	1	0											0
1,000 r	5%	23	23	23	23	23	23	23	23	23	23	22	22	22	22	22	22	22	22	22	22	21	21	21	21	91%
	20%	23	23	23	23	15	2	1	1	1	0															0
1,200 r	5%	27	27	27	27	27	27	27	27	27	26	25	24	23	23	23	23	23	22	22	22	22	22	22	22	81%
	20%	27	27	27	25	10	0																			0
1,400 r	5%	24	24	24	24	24	24	24	24	24	24	18	15	12	10	10	9	9	8	8	8	8	7	7	7	29%
	20%	12	12	12	12	7	1	0																		0

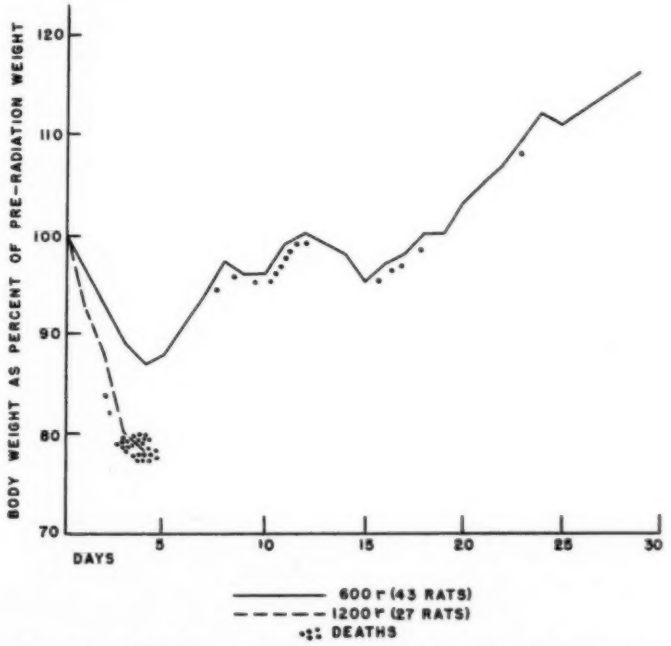
TABLE II: EFFECT OF ANOXIA ON THE SURVIVAL OF MICE AT VARIOUS DOSES OF ROENTGEN RADIATION

Dose	O_2	No. of Mice	Number Surviving One to Thirty Days																							Survivors
			1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	25	30	
800 r	7%	20	20	20	20	20	19	19	19	19	19	19	19	19	18	18	18	18	17	17	17	17	17	17	17	85%
	20%	19	19	19	19	17	15	3	1	0																0
800 r	7%	22	22	22	22	22	22	22	22	22	22	22	20	18	18	18	17	17	16	15	15	15	15	15	15	68%
	20%	18	18	18	18	17	14	4	3	2	1	0														0
800 r	10%	18	18	18	18	17	11	8	4	1	0															0
	20%	18	18	18	18	16	8	1	0																	0

Except for the first experiment, the radiation was delivered at a rate of 160 to 180 r/min. from a 250-kv. x-ray machine operated at 15 ma. The filtration was 0.21 mm. copper inherent plus 0.25 mm. copper and 1.0 mm. aluminum. The h.v.l. was 1.85 mm. copper. In the first experiment at 600 r a slightly different chamber and parabolic filter delivering 120 to 140 r/min. were used. All r values are for table level. The skin dose is approximately 20 per cent higher.

while all of the anoxic rats irradiated at 600 r and 800 r survived.

At 1,000 r, 1,200 r and 1,400 r, all the control rats died between the fourth and ninth days. At 1,000 r, 21 of 23 anoxic rats survived; 1 rat died on the tenth day and 1 on the twentieth day. At 1,200 r, 22 of 27 anoxic rats survived, the 5 deaths occurred between the ninth and seventeenth days. At 1,400 r only 7 rats of a group of 24 survived; the 17 deaths occurred between the tenth and twenty-first



Graph 1. Effect of roentgen dose on weight and survival of control rats.

The anoxia experiments on mice were carried out in the same manner, except that it was necessary to use a 7 per cent oxygen-93 per cent nitrogen mixture because the mice died of anoxia during the irradiation period when a 5 per cent oxygen-95 per cent nitrogen mixture was used.

RESULTS

In this laboratory the thirty-day LD 50 for roentgen irradiated control rats is slightly higher than 600 r. At 800 r all the control rats are dead by the thirteenth day, days. Each anoxic rat death occurred after all the corresponding controls were dead.

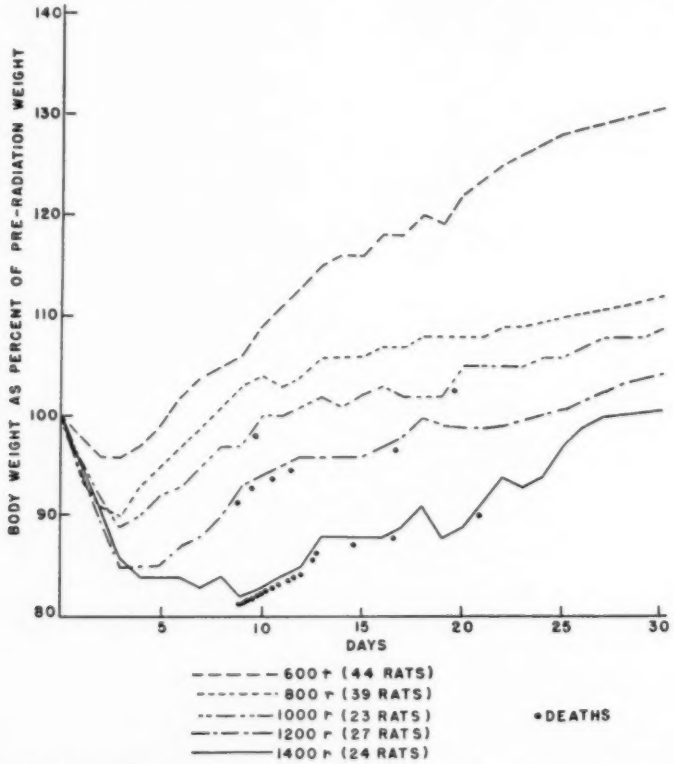
The thirty-day LD 50 for rats irradiated in 5 per cent oxygen appears to be between 1,200 and 1,400 r. These experiments are summarized in Table I.

Clinically the control rats irradiated at 600 r showed an early weight loss and diarrhea on the third and fourth days. Deaths in this group were mostly between the eighth and fifteenth day (Graph 1) and were associated with marked pallor, weakness, and intestinal hemorrhages. Animals

surviving fifteen days usually made a rapid recovery. Control rats irradiated at higher doses lost weight rapidly (Graph 1); severe diarrhea developed on the third day, continuing until death a day or two later. Bloody crusts about the eyes and nose were common after the third day. Postmortem findings on these animals showed gross distention and edema of the intestines.

mals dying at the higher dose levels (1,200–1,400 r) follow the same clinical course and show the same postmortem findings as control rats dying after a dose of 600 r. Survivors of 1,000 to 1,400 r showed some epilation over the head and back during the third to fifth weeks, but this was neither marked nor constant.

An additional control group of 8 animals



Graph 2. Effect of roentgen dose on weight and survival of anoxic rats.

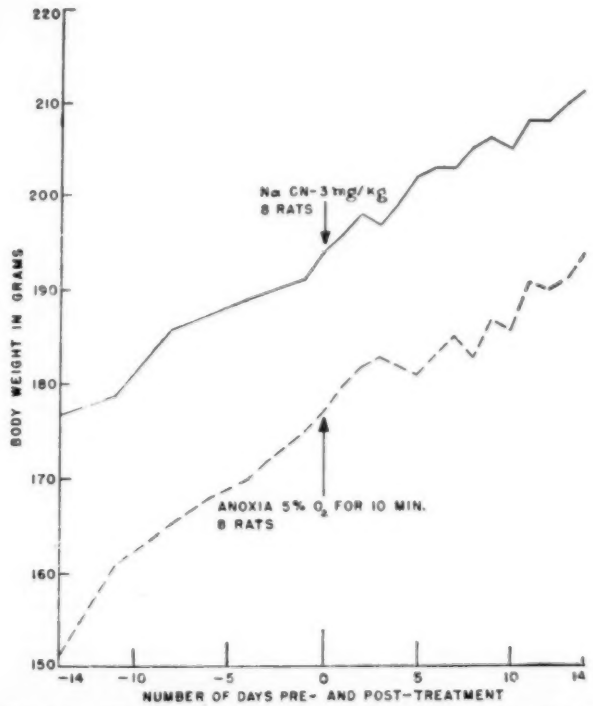
Anoxic rats lost less weight and recovered more rapidly (Graph 2). Diarrhea was seen only occasionally below 1,200 r and did not become severe except in animals receiving 1,400 r. Bloody crusts about the eyes and nose were also unusual in anoxic animals below the lethal range and were seen chiefly in animals dying at 1,400 r. Pallor was seen only in the anoxic animals that died, and from postmortem observations this appeared to be associated with intestinal hemorrhage. In general, the anoxic animals were exposed to a 5 per cent oxygen-95 per cent nitrogen mixture for ten minutes and observed for the next two weeks. These non-irradiated controls showed no evidence of clinical injury and continued to gain weight without interruption, indicating that no serious injury resulted from the brief anoxia in this experiment (Graph 3).

A limited number of experiments with mice showed that this species was partially protected by anoxic anoxia from lethal irradiation at a dosage of 800 r. Out of 42

irradiated in 7 per cent oxygen, 32 survived thirty days, while none of those irradiated in air survived more than ten days. The oxygen range in which this protection could be demonstrated is quite narrow. Reducing oxygen to 5 per cent is lethal during the irradiation period; 7 per cent gives protection, while 10 per cent fails to protect (Table II).

dose was high enough to cause collapse in the animals, but was definitely sublethal, and recovery was usually complete in twenty minutes. No protection of rats was shown at 800 r by this treatment. The clinical course and postmortem findings were similar to those found in the control rats at 800 r (Table III).

A group of 8 non-irradiated rats were



Graph 3. Effect of sodium cyanide and of anoxia on non-irradiated rats.

Histotoxic anoxia was also studied in rats given an intraperitoneal injection of sodium cyanide. A dose of 3 mg. per kilogram body weight NaCN was given to the rats three minutes before irradiation. This

given the same dose of NaCN intraperitoneally and were observed for the next week. None of the animals showed evidence of clinical injury, and all continued to gain weight without interruption (Graph 3).

TABLE III: EFFECT OF SODIUM CYANIDE-INDUCED ANOXIA ON SURVIVAL OF RATS FOLLOWING 800 r OF TOTAL BODY ROENTGEN IRRADIATION

Dose	Treatment	No. of Rats	Number Surviving One to Eleven Days										
			1	2	3	4	5	6	7	8	9	10	11
800 r	NaCN	14	14	14	14	10	5	3	2	1	1	1	0
800 r	Saline	14	14	14	14	10	2	1	1	1	0		

TABLE IV: FACTORS AFFECTING IRRADIATION INJURY

Conditions at the Time of Irradiation	Effect on Metabolic Rate	CO_2 Tension in Blood and Tissue	O_2 Tension in Tissues	Irradiation Sensitivity
Controls	Normal	Normal	Normal	Normal
Anoxic anoxia	Reduced	Reduced or normal	Reduced	Reduced
Histotoxic anoxia	Reduced	Reduced or normal	Normal	Normal
Impaired circulation	Reduced	Increased	Reduced	Reduced
Lowered body temperature	Reduced	Normal	Normal	Normal

DISCUSSION

The brief anoxic anoxia produced by irradiating rats in 5 per cent oxygen for approximately eight minutes protected them from otherwise lethal doses of total body roentgen irradiation. In these animals the arterial blood was partially saturated with oxygen; however, it is probable that during the experiment the tissues rapidly utilized the limited oxygen available, and thus the tissue oxygen tension might be reduced to values near zero. The effects of brief exposures, as used in these experiments, are quickly reversible, and no permanent injury results. Histotoxic anoxia produced by intraperitoneal injections of NaCN gave no protection. In histotoxic anoxia, oxygen is present in the tissues, but its utilization is partially blocked by CN inhibition of respiratory enzymes. This is a reversible inhibition, and as the CN is detoxified the enzymes are restored to their normal functions. Again, if the inhibition is of brief duration, no permanent injury takes place.

It has frequently been suggested that radiation injury may be reduced by the lowering of metabolism. Recent evidence, however, indicates that this may not be true. Frogs (11) and tadpoles (12) irradiated at 1.0–2.0° C. are protected only so long as they are kept at these reduced temperatures. Warming the animals results in the rapid appearance of all the effects noted when animals are irradiated at room temperature.

Since anoxic anoxia and histotoxic anoxia could be expected to cause similar effects on the metabolic rate of mammals, these experiments would appear to be another example of the independence of metabolic rate and irradiation injury.

The relationship of carbon dioxide and *p*H as they were altered by withholding of oxygen has not been investigated in this laboratory. From the experiments of Zirkle (10), the effects caused by changes in carbon dioxide and *p*H would be of much less magnitude than those found with anoxic animals. Anoxia would lower the blood and tissue CO_2 as a result of the hyperventilation which occurs under these conditions. That this loss of CO_2 and accompanying rise in *p*H is not significant is indicated by the experiments of Mottram (1) and Evans (4), in which radiation injury was reduced by impairing the circulation. Under these conditions CO_2 would increase above normal in the occluded area.

This series of experiments in conjunction with those reported in the literature indicates that irradiation injury appears to be correlated with the presence or absence of oxygen in tissues, rather than with metabolic rate, histotoxic anoxia, or CO_2 (Table IV). This suggests that a mechanism similar to that involved in *in vitro* radiochemical oxidations which require free oxygen (Fricke and Brownscombe, 14; Allsop, 15) may be involved in the irradiation syndrome observed in experimental animals. For a discussion of the possible mechanisms of reaction of H_2O and O_2, the reader is referred to the reviews of Zirkle (13), Weiss (16), and Lea (17).

SUMMARY

The effects of brief extreme anoxic anoxia on the LD 50 and on the radiation syndrome observed in mammals after total-body roentgen irradiation has been investigated. The thirty-day LD 50 for rats irradiated in 5 per cent oxygen appears to be between 1,200 and 1,400 r as contrasted with an LD 50 of slightly higher than 600 r in irra-

diated control rats. Anoxia produced by injection of NaCN failed to protect rats from roentgen irradiation. These experiments support the theory that radiochemical reactions involving free oxygen play a vital role in radiation injuries.

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REFERENCES

1. MOTTRAM, J. C.: Skin Reactions to Radium Exposure and Their Avoidance in Therapy: An Experimental Investigation. Brit. J. Radiol. **29:** 174–180, 1924.

2. MOTTRAM, J. C., AND EIDINOW, A.: On Effect of Anaemia on Reactions of Skin and of Tumours to Radium Exposure. Brit. J. Surg. **19:** 481–487, 1932.

3. MOTTRAM, J. C.: On the Alteration in Sensitivity of Cells Towards Radiation Produced by Cold and by Anaerobiosis. Brit. J. Radiol. **8:** 32–39, 1935.

4. EVANS, T. C., GOODRICH, J. P., AND SLAUGHTER, J. C.: Temperature and Radiosensitivity of Skin of Newborn Rats: Effects of Decreased Circulation and Breathing During Irradiation. Radiology **38:** 201–206, 1942.

5. CRABTREE, H. G., AND CRAMER, W.: Action of Radium on Cancer Cells. Some Factors Determining the Susceptibility of Cancer Cells to Radium. Proc. Roy. Soc. B. **113:** 238–250, 1934.

6. ANDERSON, R. S., AND TURKOWITZ, H.: Experimental Modification of the Sensitivity of Yeast to Roentgen Rays. Am. J. Roentgenol. **46:** 537–542, 1941.

7. GILES, N. H., JR., AND RILEY, H. P.: Effect of Oxygen on the Frequency of X-Ray-Induced Chromosomal Rearrangements in Tradescantia Microspores. Atomic Energy Commission Document, ORNL 376.

8. THODAY, J. M., AND READ, J.: Effect of Oxygen on the Frequency of Chromosome Aberrations Produced by X-Rays. Nature **160:** 608, 1947. Effect of Oxygen on the Frequency of Chromosome Aberrations Produced by Alpha-Rays. Nature **163:** 133–134, 1949.

9. Personal observations.

10. ZIRKLE, R. E.: Modification of Radiosensitivity by Means of Readily Penetrating Acids and Bases. Am. J. Roentgenol. **35:** 230–236, 1936.

11. PATT, H. M., AND SWIFT, M. N.: Influence of Temperature on the Response of Frogs to X Irradiation. Am. J. Physiol. **155:** 388–393, 1948.

12. ALLEN, B. M., SCHJEIDE, O. A., AND HOCHWALD, L. B.: Relation of Low Temperature to X-Ray Injury of Hematopoietic Tissue of Tadpoles. Proc. Exper. Biol. & Med. **73:** 60–62, 1950.

13. ZIRKLE, R. E.: Relationships Between Chemical and Biological Effects of Ionizing Radiations. Radiology **52:** 846–855, 1949.

14. FRICKE, H., AND BROWNSCOMBE, E. R.: Inability of X-Rays to Decompose Water. Phys. Rev. **44:** 240, 1933.

15. ALLSOP, C. B.: Radiochemistry: A Review of Recent Progress. Trans. Faraday Soc. **40:** 79, 1944.

16. WEISS, J.: Some Aspects of the Action of Radiations of Aqueous Solutions. Brit. J. Radiol., Supplement I, 1947, pp. 56–59.

17. LEA, D. E.: Actions of Radiations on Living Cells. London, Cambridge University Press, 1946.

SUMARIO

Acción Protectora de la Anoxia Anóxica contra la Irradiación Roentgen Total del Cuerpo de los Mamíferos

Los efectos de una breve anoxemia extremada sobre la DL 50 y sobre el síndrome de radiación observado en los mamíferos después de la irradiación roentgen total del cuerpo fueron investigados. La DL 50 de treinta días para las ratas irradiadas en 5 por ciento de oxígeno parece quedar entre 1,200 y 1,400 r, en contraposición a poco más de 600 r en las ratas testigos irradiadas. La anoxia producida por la inyección de NaCN no protegió a las ratas contra los rayos X. Estos experimentos prestan apoyo a la teoría de que las reacciones radioquímicas en que interviene oxígeno libre desempeñan un papel cardinal en las lesiones debidas a la radiación.

Tilt Table Attachment for Chest Planigraphy in Upright and Recumbent Positions[1]

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SECTIONAL RADIOGRAPHY in the upright position is receiving increasing consideration in the examination of the chest. Rigler (1) alludes to the possible advantage it offers in cases where it is important to retain the visibility of fluid levels in pulmonary cavities. McDougall (4) mentions, as an additional advantage of the upright position, the readiness with which a patient can be observed fluoroscopically and positioned for sectional studies, particularly for oblique views.

The upright position facilitates study of the heart, mediastinum, and larger vessels, as well as of lesions adjacent to these structures and to the diaphragm. In short, all of the familiar advantages of upright radiography of the thorax, dependent as they are upon the fullest possible inspiration, apply equally to sectional radiography of the chest. For the very sick or debilitated patient, the recumbent position remains necessary. The simple tilt-table device to be described here permits upright sectional

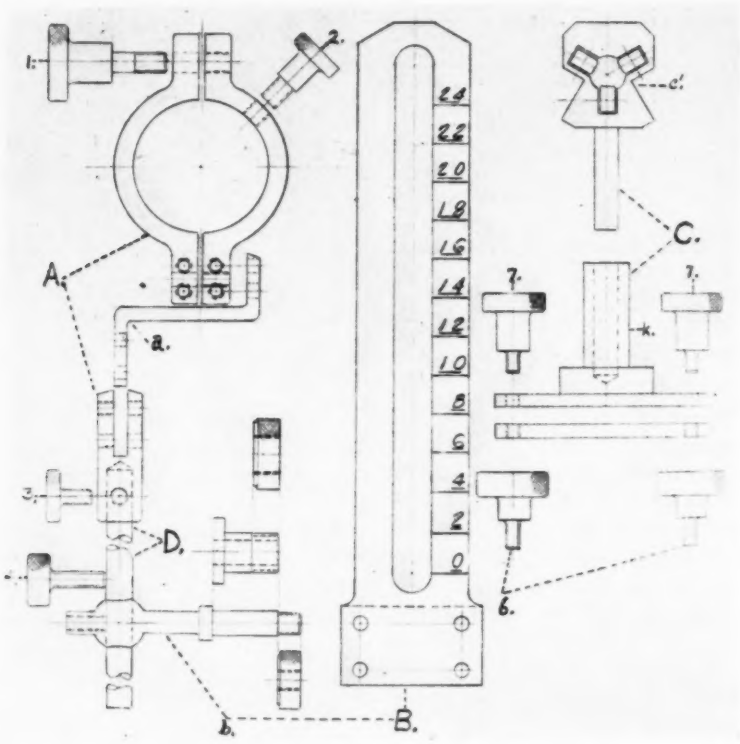

Fig. 1. Parts of device drawn to scale.

[1] From the Department of Diagnostic Roentgenology, Montefiore Hospital, New York. Accepted for publication in April 1950.

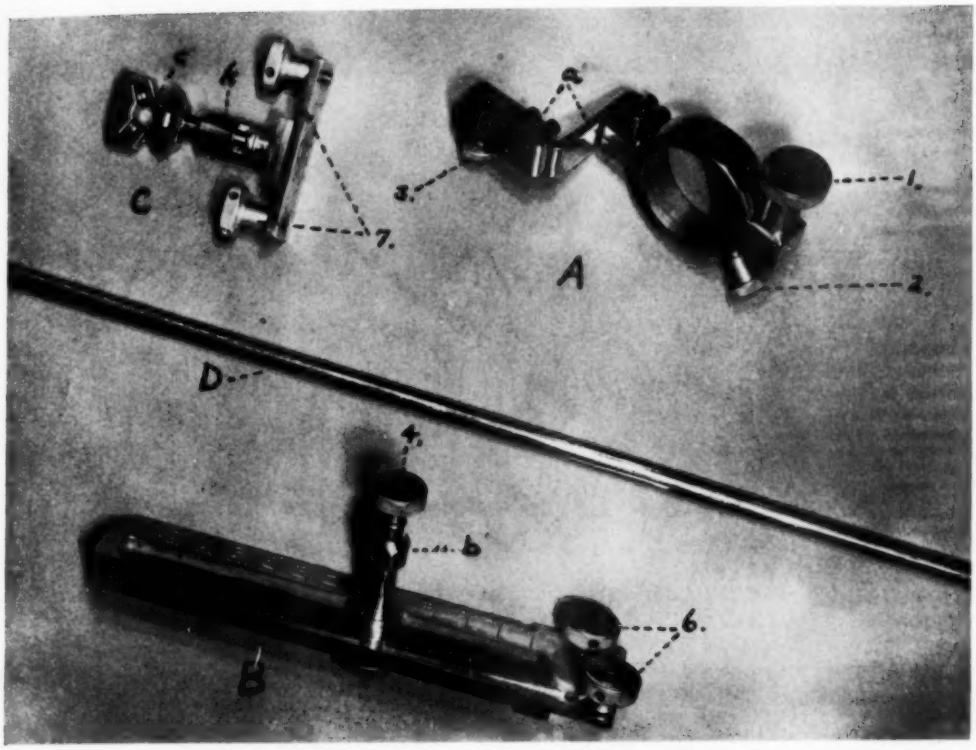

Fig. 2. Parts of device unassembled.

radiography without sacrificing the usual recumbent position.

The attachment consists of three main pieces, A, B, and C, and a connecting lever rod, D, as shown in Figures 1 and 2. These parts, ground out of cold-rolled steel and chromium plated, have been drawn to scale in Figure 1 and photographed unassembled in Figure 2. Figure 3 shows the device attached to the x-ray machine, ready for use in the recumbent and upright positions.

Part A consists of a bivalved cuff. On the x-ray machine illustrated in Figure 3, the cuff (A) encircles the x-ray tube arm (F) and through its elbow (a) aligns itself with the connecting lever rod (D). This rod inserts in a hole in the end of the elbow (a) and is anchored by means of a thumbscrew (3). The large thumbscrew (1) tightens the grasp of the cuff (A) about the tube arm (F). A thumbscrew (2) passing through the cuff into a pre-existing groove in the tube arm further secures the latter. As the lever rod pivots about its fulcrum, the x-ray tube is rotated and moved in a rectilinear manner. On machines other than the one illustrated, where the tube is suspended between two parallel bars instead of on the end of a single tube arm, a cross piece between the two bars may be used as the receptacle for the lever rod (D).

Part B of this attachment consists of a slotted plate of steel with an adjustable, rotating fulcrum bar (b). This slotted plate (B) is affixed to the side of the x-ray table (E) by means of the thumbscrews (6) at its base. It is calibrated in centimeters for setting the fulcrum bar at various levels above the table. The level of this setting determines the plane of the sectional roentgenogram. The connecting lever rod (D) passes through the pivoting fulcrum (b). When thumbscrew 4 is allowed to remain

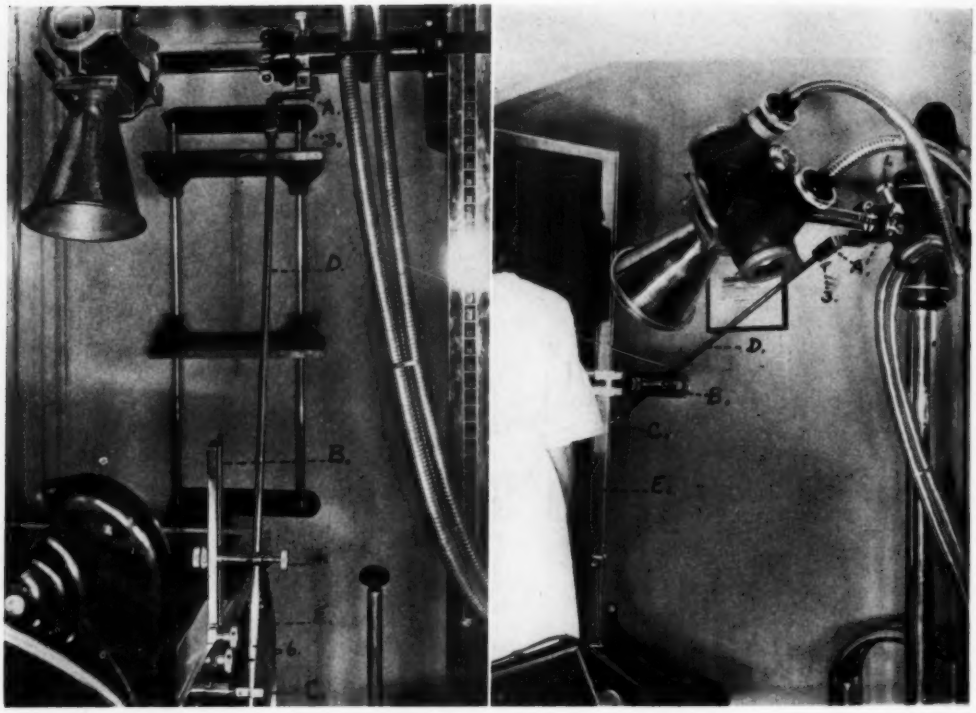

Fig. 3. Device attached to x-ray machine, ready for use in recumbent and upright positions. For explanation see text.

loose, this lever rod (D) slides up and down through the fulcrum bar (b) and results in the planigraphic method of tube travel.

Part C consists of a swivel head (c) on a base plate, the latter being attached to the side of the Potter-Bucky film carriage by means of thumbscrews (7) at its base. The swivel head accepts the connecting rod (D) and transmits the motion of the latter to the film carriage. Within the swivel head (c), three roller bearings face the connecting rod and help to eliminate friction. A fourth roller bearing on the retaining shaft (k) of the swivel head helps to steady the film carriage as it rides along under the table (E).

Part D is a round steel bar 36 inches in length. This rod, acting through its variable fulcrum level (b), imparts to the x-ray film carriage and x-ray tube the necessary continuous reciprocal motion.

The cuff (A) is left attached to the x-ray tube arm (F). Assemblage of the remains ing parts for sectional radiography requireless than a minute. Motion may be imparted to the mechanism by means of a motor driven gear, chain, or wheel. A simple hand-drawn cord may also be used. In any case, the x-ray tube arm and film motion must by synchronized with the exposure time.

The device described above can be adapted to any x-ray machine having an independently movable Potter-Bucky film carriage and x-ray tube. It permits such an x-ray machine with a tilt-table to perform sectional radiography in both the upright and recumbent positions. When desired, planigraphy in the Trendelenburg position is also possible by tightening thumbscrew 4. The slight modifications required in adapting this apparatus to various machines will depend mainly on the type of x-ray tube arm.

This apparatus, through variations in adjustment of thumbscrews 1, 2, and 4, permits the selection of any one of three types of rectilinear x-ray tube motion. A technical and clinical evaluation of these patterns of motion will be reported elsewhere.

SUMMARY

A simple device is described for sectional radiography of the chest in the erect as well as the horizontal position. Adding the upright position to the examination overcomes an otherwise serious limitation of this method of roentgenographic study.

While the unit described has been found useful in the author's practice, many of the standard units being manufactured today can be used similarly.

REFERENCES

1. RIGLER, L. G., AND MERNER, T. B.: Planigraphy in the Diagnosis of Bronchogenic Carcinoma. Am. J. Roentgenol. **58:** 267–276, September 1947.
2. TWINING, E. W.: Tomography by Means of a Simple Attachment to the Potter-Bucky Couch. Brit. J. Radiol. **10:** 332–347, April 1937.
3. ALEXANDER, H.: A Simple and Inexpensive Tomographic Method. Am. J. Roentgenol. **39:** 956–958, June 1938.
4. MCDOUGALL, J. B.: Tomography. London, H. K. Lewis & Co., Ltd., 1940.
5. FRIMANN-DAHL, J.: On the Value of Planigraphy in Bronchial Carcinoma. Acta radiol. **27:** 99–114, 1946.
6. SCOTT, W. G., MOORE, S., AND RUSSELL, T. G.: Body Section Radiography in Diagnosis of Aortic Aneurysms and Mediastinal Tumors. South. M. J. **34:** 343–350, April 1941.
7. ZIEDSES DES PLANTES, B. G.: Eine neue Methode zur Differenzierung in der Röntgenographie (Planigraphie). Acta radiol. **13:** 182–192, 1932.
8. STARR, E.: Body Section Roentgenography at an Army Station Hospital. Am. J. Roentgenol. **54:** 312–314, September 1945.

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SUMARIO

Accesorio en Mesa Inclinada para la Planigrafía Torácica en las Posíciones Erguida y Recostada

El sencillo accesorio descrito está destinado a empleo en la planigrafía del tórax en las posiciones tanto erecta como recostada. El accesorio puede ajustarse a cualquier aparato de rayos X dotado de portapelículas de Potter Bucky y tubo de rayos X de movimiento independiente.

La adición de la posición erguida al examen elimina una limitación bastante seria de la tomografía torácica, según se practica habitualmente, facilitando el estudio del corazón, el mediastino y los vasos mayores, así como de las lesiones adyacentes a dichos órganos y al diafragma.

Electronic Timer for Developing Rooms and Physiotherapy[1]

E. G. ESCHNER, M.D., and B. R. STEPHENSON, Ph.D.

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THE TIMER HEREIN described was designed to repeat indefinitely any given time interval up to twenty minutes and to provide for remote control. Many timers have been developed for darkroom timing, but either they would not repeat or they had to be set by the technician, frequently with wet hands, causing corrosion of the parts. Clock mechanisms, either spring- or motor-driven, were often out of adjustment due to wear or corrosion of some part as a result of frequent rough manipulation in the semidarkness of the developing room.

In this x-ray department a succession of timers has been used, none of which has worked correctly for any great length of time. In the electronic timer to be described here, made of standard radio parts, the only moving elements are switches, which can be easily replaced. With a temperature-controlled developer, the timer itself has to be touched only once or twice a day to set the time. The timer then can be placed back out of the way and turned on and off by a remote toggle switch (S_5, Fig. 2) placed convenient to the operator.

Electronic timers have frequently been described, based on the familiar RC principle of charging or discharging a condenser through a resistor to control the current through a thyratron. These are usually relatively complicated, involving the use of two or more tubes with a stabilized voltage. For high accuracy such circuits may be necessary, but developing time in the ordinary darkroom is usually not so critical and may vary within a few seconds.

The fundamental operation of this timer is based on utilizing the grid of the 2050 thyratron as a plate to charge the condensers and then using this charge on the grid to block the plate circuit until the charge has leaked off through the resistors. The time of discharge is controlled by selecting the proper resistor-capacity combination to give minutes and seconds.

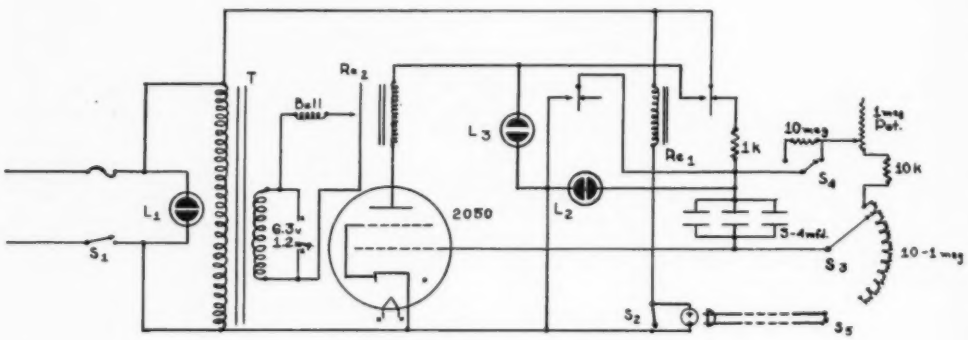

Fig. 1. Wiring diagram of timer.

Tube: 2050 thyratron. Three 4 mfd., 600-volt Cornell-Dubilier condensers TJH 6040 G. T. Filament transformer, 6.3 volts, 1.2 amp., Stancor #P 6134. L_1, L_2, and L_3. Neon glow lamps, 1/4 watt. Bell: Ordinary doorbell, closed type. Re_1. DPDT Guardian relay, series 200, with 115-volt A.C. coil. Re_2. Plate relay, Staco MR-2, 2,500-ohm coil. S_1, S_2. SPST toggle switch. S_3. Centralab ten-step switch, K-121, with ten 1-megohm 1/4-watt resistors. S_4. SPDT toggle switches. S_5. SPST remote control switch.

[1] From the Departments of Radiology and Physics, E. J. Meyer Memorial Hospital, Buffalo, N. Y. Accepted for publication in February 1950.

Minutes are controlled by a step switch (S_3, Fig. 1), while seconds are controlled by a calibrated 1-megohm linear taper volume control.

T, in Figure 1, is a small filament transformer which is used to heat the filament and furnish power to ring the signal bell. Relay 1 (Re_1) is a DPDT Guardian 115-volt A.C. relay used to control the charge and discharge circuits. Relay 2 (Re_2) is a 2,500-ohm plate relay which is used here to control the bell circuit and which can also be used to open or close any circuit desired. L_1 is a neon 1/4-watt pilot lamp, which also illuminates the dials on the timing switches. L_2 indicates when the timer is charging. L_3 shows when the condenser is discharging and the timing circuit is on. Resistor 10K is used to protect the contacts on the step switch and potentiometer from direct discharge of the condenser when the timer is set near zero. The 10-megohm resistor is used to add ten minutes to the timing period when SPDT, S_4, is reversed.

The timer is in the stand-by position with the contacts of the DPDT relay normally closed. In this position the condensers are quickly charged through the grid. Five to fifteen seconds are sufficient to give a constant time of discharge, depending on the quality of the condensers. In order to activate the timer, either the remote control S_5 or the panel switch S_2 is closed, which causes the contact of the DPDT switch, Re_1, to close to the left. This position places the charge of the condensers between the cathode and grid, blocking the plate current of the tube. When the charge has leaked off through the chosen resistors from approximately 145 volts to approximately 2 volts, the plate current flows and activates the bell through Re_2. S_5 or S_2, whichever was used to institute the timing cycle, is then opened, and the timer is ready to repeat.

Any combination of condensers and resistors may be used which will give the desired time interval. Several timers have been built using 12 microfarad capacity, which require 1 megohm per minute. One was built using 6 microfarad capacity with which 2.3 megohm gave one minute.

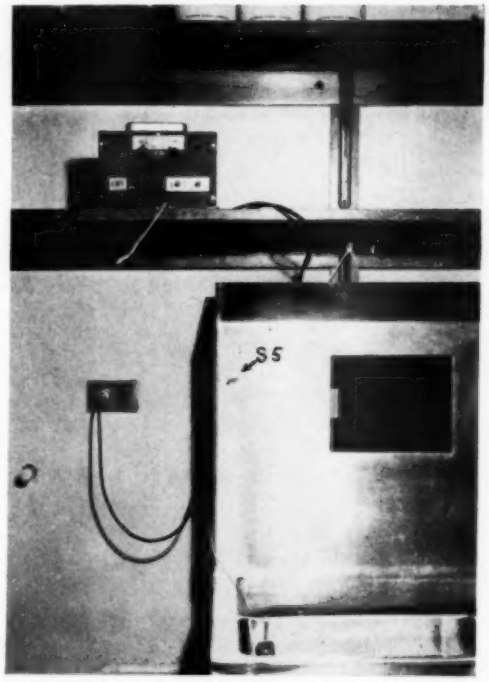

Fig. 2. Timer in use, to show position of remote control (S_5).

Since the tube is used far below its rated capacity, it should seldom need to be changed. The timers are not affected appreciably by changes in line voltage. When the applied line voltage was increased from 100 to 125 volts, the change in time was approximately 2 per cent. Neither high humidity nor usual high summer temperatures had any measurable effect on the timer.

Two timers in use for nine or ten months have given no trouble of any kind.

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(*Para el sumario en español, véase la página siguiente.*)

SUMARIO

Cronómetro Electrónico para el Cuarto de Revelado y la Fisioterapia

El aparato electrónico aquí descrito para empleo en el cuarto oscuro permite repetir indefinidamente cualquier período de tiempo que no exceda de veinte minutos. Está compuesto de piezas corrientes de aparatos radiotelefónicos y los únicos elementos movibles consisten en conmutadores que son fáciles de reponer. Con un revelador regido por la temperatura, no hay que tocar el cronómetro mismo más que una o dos veces al día para fijar la hora. Puede entonces dejarse a un lado y echarlo a andar o pararlo por medio de un conmutador remoto de palanca cercano al operario.

EDITORIAL

Siderosis and Silicosis

The exact differential diagnosis of the various forms of pneumoconiosis not only involves serious medical consequences but has legal implications as well. The demonstration of the anatomic and physiologic manifestations of this disease lies largely in the field of roentgenology, thus placing upon the radiologist the responsibility of familiarizing himself not only with the exact pattern of the abnormal lung changes but also with a complete industrial history of the patient.

According to Pendergrass and Robert (4), "pneumoconiosis is a broad generic term used to describe all forms of pulmonary reaction to dust lodging in the lungs, with no implication as to the character, severity, or effect on function." Included under this term are the specific pneumoconioses, of which silicosis is the most widespread and most commonly seen by the radiologist, and various non-specific types due to the inhalation of mineral dusts. While the latter do not carry the same medical implications as silicosis, the roentgen picture may be indistinguishable. A detailed occupational history is therefore essential in all cases showing generalized nodulation over the lung fields.

It has been shown that finely divided particles of silica acting specifically on pulmonary tissue produce nodular fibrotic lesions which tend to increase in size and, with continued exposure, coalesce into larger areas of opacity. Even under the latter circumstances, however, unless infection develops, there may be very little disability. Pendergrass and Robert call attention to the fact that it is the presence of such associated infection which accounts for the disabling effects of silicosis.

In a recent communication, Hamlin and Weber (3) reported the occurrence of pulmonary nodulation in a group of foundry cleaning room employees whose clinical histories did not suggest silicosis. In 67 per cent of the group the lesions appeared after less than ten years employment as burners and grinders. This is considered an insufficient time for the development of silicosis under the conditions of dust concentration to which these workers were exposed. It was felt, therefore, that the pulmonary changes were the result of deposits of inert iron dust in the lungs without the production of fibrosis. These patients had little disability, and the onset of tuberculous infection in a number of cases produced no changes in the nodulation. It was observed also that, once well developed nodular shadows were demonstrated roentgenographically, these showed no change in subsequent examinations even though the workers continued at the same occupations. This is not usually the case with continued exposure to significant concentrations of free silica in particles of respirable size.

Samples of the air-borne dust in the plant in question were carefully studied, and the concentration was found to average 25 million particles per cubic foot of air. Free silica was present in an average proportion of 6.2 per cent, which is a low figure. Iron oxide varied from 37.4 per cent to 90.0 per cent, with an average of 64.3 per cent, an amount which is well in excess of safe limits.

In view of these clinical studies, an experimental study of the pulmonary reaction in animals following inhalation of foundry dust was undertaken by Vorwald, Pratt, Durkan, Delahant, and Bailey (5) of the Saranac Laboratory of the Trudeau

Foundation. "Cleaning room dust" was mechanically disseminated into an animal room containing guinea-pigs, rats, and rabbits. The cloud of atmospheric dust was maintained for three years, which involves an exposure corresponding to the exposure of industrial workers during an entire working lifetime.

Serial chest roentgenograms of the exposed animals revealed nodular densities throughout the lung fields after two to three years of exposure. Gross and microscopic examination of the lungs showed round or elongated foci of accumulated dust without fibrosis. The course of R_1 tuberculous infection in guinea-pigs was unaltered by exposure to the dust. The roentgen changes were attributed to the fact that radiopaque iron oxide was the major component of the inhaled dust, which must be regarded as "inert." These experiments thus provide pathological confirmation of the clinical studies reported by Hamlin and Weber.

Doig and McLaughlin (2) reported that re-examination, in 1945, in 15 cases of welders' siderosis described by them in 1936 disclosed that all but two of the patients continued to work as welders and all remained in good health. Those who showed little change in 1936 showed no progression. Of those with pronounced changes, one showed considerable clearing, and in one the lung findings were normal at the second examination. In a later communication (1) Doig states that inhaled iron dust is quite inert and does not lead to fibrosis. Pulmonary nodulation may be due to a variety of conditions, of which fibrosis is only one. The radiopaque shadows of siderosis, though they may be indistinguishable from those of silicosis, are actually due to the metallic content of the inhaled dust.

These studies give convincing proof, if such is needed, that the roentgenologist must proceed with caution in the diagnosis of simple silicosis from the film alone. It is essential that he obtain as complete an industrial history as is available before making a statement that may have a profound effect on the patient's future. As Hamlin and Weber point out, misdiagnosis is a great disadvantage to the worker, who will often leave a satisfactory job for one less desirable if he cannot be convinced that his daily work offers no undue risk.

REFERENCES

1. DOIG, A. T.: Industrial Siderosis. Edinburgh M. J. **56:** 230–234, June 1949.

2. DOIG, A. T., AND MCLAUGHLIN, A. I. G.: Clearing of X-Ray Shadows in Welders' Siderosis. Lancet **1:** 789–791, May 22, 1948.

3. HAMLIN, L. E., AND WEBER, H. J.: Siderosis. A Benign Pneumoconiosis Due to the Inhalation of Iron Dust. Part I. A Clinical, Roentgenological and Industrial Hygiene Study of Foundry Cleaning Room Employees. Indust. Med. & Surg. **19:** 151–169, April 1950.

4. PENDERGRASS, E. P., AND ROBERT, A. G.: Some Considerations of the Roentgen Diagnosis of Silicosis and Conditions That May Simulate it. Radiology **50:** 725–745, June 1948.

5. VORWALD, A. J., PRATT, P. C., DURKAN, T. M., DELAHANT, A. B., AND BAILEY, D. A.: Siderosis. A Benign Pneumoconiosis Due to the Inhalation of Iron Dust. Part II. An Experimental Study of the Pulmonary Reaction Following Inhalation of Dust Generated by Foundry Cleaning Room Operations. Indust. Med. & Surg. **19:** 170–180, April 1950.

ANNOUNCEMENTS AND BOOK REVIEWS

THIRD ANNUAL MID-WINTER RADIOLOGICAL CONFERENCE

The Third Annual Mid-Winter Radiological Conference, sponsored by the Los Angeles Radiological Society, will be held at the Biltmore Hotel, Los Angeles, Feb. 24 and 25, 1951. Dr. W. Edward Chamberlain, Professor of Radiology, Temple University, Philadelphia, will be the guest speaker at the banquet, Saturday evening, Feb. 24 A second out-of-state speaker at the Conference will be Dr. Edward B. D. Neuhauser, Roentgenologist at the Infants and Childrens Hospital, Boston. Reservations for both Conference and banquet should be sent to Dr. John B. Hamilton, 210 N. Central Ave., Glendale 3, Calif., accompanied by a check for $20.00 ($15.00 for the Conference and $5.00 for the banquet).

Hotel reservations may be made by applying directly to the convention manager of the Biltmore Hotel, Los Angeles. Early reservations are suggested since accommodations are limited.

COURSE IN RADIOLOGICAL HEALTH UNIVERSITY OF MICHIGAN

At the request of the Michigan Health Officers Association, the School of Public Health of the University of Michigan is offering an Inservice Training Course in Radiological Health, Feb. 5–8, 1951, at Ann Arbor, Mich.

The aim of the course is to clarify and co-ordinate information on a subject deemed to be of increasing importance to public health workers. It is designed especially for the average health department personnel, such as health officers, engineers and sanitarians, industrial hygiene personnel, and perhaps some nurses, with a view also to serving certain workers in industry. While the course is set up to meet a need presented by public health workers of Michigan, interested persons elsewhere are welcome. The members of the special faculty have been selected with respect to their known accomplishment in simplicity of presentation as well as their command of the science in which they are engaged.

Applications for enrollment in the course should be addressed to H. E. Miller, School of Public Health, Ann Arbor, Mich. The enrollment fee is $5.00. Applicants will be enrolled to the extent of seating space available. It is suggested therefore that persons planning to attend make early application.

COMMISSION MIXTE DE RADIOBIOLOGIE

The Commission on Radiobiology of the International Council of Scientific Societies held its first meeting in July 1950 in the library of the Pavillon Pasteur of the Radium Institute, Paris.

Prof. G. Hevesy was elected president and Dr. Bonet-Maury secretary. The principal subjects for discussion were the project of an International Institute of Radiobiology, the publication of radiobiological literature, the definition of the degree of radiosensitivity, and the possibilities of exchange of standard biological material. Subcommittees were appointed to study the question of an International Institute and to bring together the existing material on the measurement of radiosensitivity.

DR. L. R. SANTE HONORED

Dr. L. R. Sante of St. Louis was honored at a reunion dinner given by his former radiological residents at the Hotel Sheraton in St. Louis, Mo., on Sept. 26, 1950. More than 80 persons, consisting of former radiological residents of St. Louis University School of Medicine and St. Louis City Hospital, and their wives, were assembled for the occasion. Dr. Sante's former teacher in Radiology during World War I, Dr. William H. Stewart, of New York, acted as toastmaster.

ERRATUM

On rechecking the paper on "Million-Volt Beryllium-Window X-ray Equipment for Biophysical and Biochemical Research" by Wm. T. Ham, Jr., and E. Dale Trout, appearing in RADIOLOGY for August 1950, the authors have discovered an unfortunate error involving the equation at the top of page 266. The last 7 lines on page 265, column 2, and the equation at the top of page 266, column 1, should be changed to read:

"Thus, the dosage rate in r/min. may be calculated from the rate of energy input dQ/dt, as follows: The mass of water exposed to the x-ray beam was 1.8 gm., and the energy equivalent in 1 gm. of water for 1 r as measured in air is 93 ergs/r. Taking D as 1.0 gm./c.c. and J as 4.18×10^7 ergs/cal, the equation becomes

$$\text{r/min.} = \frac{4.18 \times 10^7}{1.8 \times 93} V(T_2 - T_1) = 25 \times 10^4 V(T_2 - T_1)$$"

This correction means that all dosage rates calculated by the water absorption method, as given in the paper, should be divided by 1.8. Thus, on page 268, column 2, line 9, the dosage rate should be changed to 46,000 r/min.; in line 12, to 28,000 r/min.; in line 13, to 11,000 r/min. Similarly, on page 269, column 1, in line 3 the figure becomes 40,500; in line 6, 2,800,000, and the correction factor in line 10 becomes 0.8. In column 2, page 269, line

1, the dosage becomes 42,000 r/min. On page 270, column 2, line 14, should read "de 42,000 a 50,000 r por minuto."

Books Received

Books received are acknowledged under this heading, and such notice may be regarded as recognition of the courtesy of the sender. Reviews will be published in the interest of our readers and as space permits.

RADIATION THERAPY IN THE MANAGEMENT OF CANCER OF THE UTERINE CERVIX. By SIMEON T. CANTRIL, M.D., Director, Tumor Institute of the Swedish Hospital, Seattle, Wash. Publication No. 55, American Lecture Series, edited by Milton Friedman, M.D. A volume of 196 pages, with 25 figures and 30 tables. Published by Charles C Thomas, Springfield, Ill., 1950. Price $5.00.

THE 1950 YEAR BOOK OF RADIOLOGY (June, 1948–June, 1950.). Radiologic Diagnosis, edited by FRED JENNER HODGES, M.D., Professor and Chairman, Department of Roentgenology, University of Michigan, and JOHN FLOYD HOLT, M.D., Associate Professor, Department of Roentgenology, University of Michigan. Radiation Therapy, edited by ISADORE LAMPE, M.D., Associate Professor, Department of Roentgenology, University of Michigan, and ROBERT S. MAC INTYRE, M.D., Assistant Professor, Department of Roentgenology, University of Michigan. A volume of 480 pages, with 397 illustrations. Published by the Year Book Publishers, Chicago 11, Ill., 1950. Price $6.75.

THE ROYAL CANCER HOSPITAL MECHANICALLY SORTED PUNCHED CARD INDEX SYSTEM. Edited by the Records Committee: A. H. HUNT, M.A., D.M., M.Ch., F.R.C.S., *Chairman:* D. W. SMITHERS, M.D., M.R.C.P., D.M.R.; M. LEDERMAN, M.B., B.S., D.M.R.E., F.F.R.; M. H. HARMER, M.B., B.Ch., F.R.C.S.; K. M. TURNER, B. Sc., Hon. Sec. and Medical Records Officer. A volume of 102 pages. Published by the Royal Cancer Hospital, London SW 3, England, 2d ed., 1950.

A TEXT-BOOK OF X-RAY DIAGNOSIS. By British Authors. In four volumes. Edited by S. COCHRANE SHANKS, M.D., F.R.C.P., F.F.R., Director, X-Ray Diagnostic Department, University College Hospital, London, and PETER KERLEY, M.D., F.R.C.P., F.F.R., D.M.R.E., Director, X-Ray Department, Westminster Hospital; Radiologist, Royal Chest Hospital, London. Vol. III. THE ABDOMEN. A volume of 830 pages, with 694 illustrations. Price $18.00. Vol. IV. BONES, JOINTS, AND SOFT TISSUES. A volume of 592 pages, with 553 illustrations. Price $15.00. Published by W. B. Saunders Co., Philadelphia, 2d. ed., 1950.

PHYSICIANS FEDERAL INCOME TAX GUIDE AND SIMPLIFIED ACCOUNTING RECORD. 1951 Edition, for the preparation of 1950 returns and 1951 estimates. By HUGH J. CAMPBELL AND JAMES B. LIBERMAN. A volume of 128 pages. Published by Doniger & Raughley, Inc., Great Neck, New York. Price $2.50.

Book Reviews

BONE AND JOINT DISEASES. PATHOLOGY CORRELATED WITH ROENTGENOLOGICAL AND CLINICAL FEATURES. By J. VERNON LUCK, M.S. (Ortho.), M.D., F.A.C.S., F.I.C.S., Assistant Clinical Professor of Orthopedic Surgery, University of Southern California; Senior Attending Physician, Department of Orthopedic Surgery, and Consultant in Orthopedic Pathology, Los Angeles County Hospital; Member, Subcommittee on Orthopedic Surgery, National Research Council; Member, Board of Associate Editors, Journal of Bone and Joint Surgery. A volume of 614 pages, with 703 illustrations, including 21 in color. Charles C Thomas, Springfield, Ill., 1950. Price $16.50.

This new book on diseases of bones and joints is primarily a text on pathology, more especially as it may be correlated with the roentgenologic and clinical findings. The attempt is made to dispel the idea that bone is an inert supporting framework only, and to show that it is, instead, active physiologically and chemically. "The roentgenologist," writes the author in his preface, "rises above seeing mere shadows on his roentgenograms when his knowledge of physiology and pathology enable him to visualize the shadows unfolding before him as living tissues undergoing their kaleidoscope of changes."

The book opens, logically, with a chapter on the normal skeletal system and there follow discussions of infections of various types, fractures, and arthritides, metabolic disorders, endocrine disorders, fibrocystic diseases, congenital defects, extraskeletal calcification, osseous lesions in the reticulo-endothelioses, lesions secondary to deposition of various metals, and benign and malignant tumors, each chapter concluding with a classified bibliography.

While, as intimated above, the emphasis is largely on pathology, the radiologist will find that the work offers him a valuable background for the interpretation of his radiologic findings. It is to be recommended as a clear, concise discussion of diseases and abnormalities of the skeletal system.

The book is clearly printed on excellent paper, and the numerous illustrations in black and white and in color add both to its usefulness and attractiveness.

THE CLINICAL USE OF RADIOACTIVE ISOTOPES. By BERTRAM V. A. LOW-BEER, M.D., Associate Professor of Radiology, University of California Medical School, San Francisco, Calif. Publication No. 54, American Lecture Series, a monograph in American Lectures in Radiation Therapy, edited by Milton R. Friedman, M.D. A volume of 436 pages, with 105 illustrations. Published by Charles C Thomas, Springfield, Ill., 1950. Price $9.50.

Low-Beer has written what may become the primer of clinical isotope radiology. Brevity, clarity, and good illustrations combine for effective presentation. In Part I on Physics the author has made a great effort to be understandable; one of the most palatable discussions on the *roentgen* in our literature will be found in the section on units and standards. Part II outlines the clinical applications of radioactive isotopes, discussing, in sequence, clinical investigations, dosage determinations, and therapy. The section on dosage merits careful reading. Mathematical formulae are seldom overwhelming in this text and are cushioned with adequate verbal interpretation. At the end of the text are appended useful graphs and tables, such as "Summary of Atomic Particles" and "Gamma Ray Shielding." Hundreds of references to the literature are listed.

Radiologists in general will find this an excellent orientation in this field, a springboard to wider reading.

MALIGNANT DISEASE AND ITS TREATMENT BY RADIUM. By SIR STANFORD CADE, K.B.E., C.B., F.R.C.S., M.R.C.P., Surgeon, Westminster Hospital; Consulting Surgeon, Mount Vernon Hospital and Radium Institute; Lecturer in Surgery, University of London; Member of the Council and of the Court of Examiners, late Hunterian Professor and Arris and Gale Lecturer, Royal College of Surgeons of England; Hon. Member, American Radium Society; Consultant in Surgery to the Royal Air Force. With a Foreword by SIR ERNEST ROCK CARLING, F.R.C.P., F R.C.S., F.F.R., Consulting Surgeon and Vice-President, Westminster Hospital. Second edition, Vol. III. Four hundred and forty-six pages, with 182 figures, many in color. The Williams & Wilkins Co., Baltimore, Md., 1950. Price $12.50.

Cade has given us an ably written account of the clinical course, diagnosis, and pathology of cancer of the chest, breast, genitals, and gastro-intestinal and urinary tracts in this third volume of his "Malignant Disease and Its Treatment by Radium." It would be unfair to prejudice the reader and limit the reach of this work by labeling it as simply a radiotherapy text. However, a critical evaluation of the place of radium (and x-ray) in these diseases is presented, undistorted by specialty bias. General surgeons and gynecologists will find this a useful orientation and to the radiologist it will prove an excellent guide. This volume should be available to all those engaged in the therapy of cancer. The chapter on "The Breast" is mandatory reading. The book is small, well bound, and superbly illustrated.

LE ZONE POLMONAIR. By DR. LUCIO DI GUGLIELMO. From Istituto di Radiologia e Terapia Fisica dell'Università di Pavia (Direttore: Prof. A. Ratti) and Istituto di Radiologia e Terapia Fisica dell'Università di Napoli (Direttore inc.: Prof. G. Muscettola). Preface by PROFESSOR ARDUINO RATTI. A volume of 304 pages, with 231 illustrations and 4 color plates. Edizioni Scientifiche Italiane, Naples, 1949.

In recent years surgeons have begun to resect only the diseased portion of a pulmonary lobe instead of performing a complete lobectomy. This technic has great possibilities because it conserves the anatomy and function of more lung tissue. The method, pioneered in this country by Churchill and Belsey, is based upon the fact that lobes are composed of smaller anatomical units called pulmonary segments, each segment being separated from the contiguous segments by loose connective tissue and being supplied by autonomous bronchovascular branches.

Roentgenologists working in conjunction with chest surgeons will be called upon to localize pulmonary lesions with more accuracy than ever before. This requires a detailed knowledge of the anatomy and location of each segment so that the surgeon may be told exactly where and how to approach the diseased area. Professor Di Guglielmo attempts to supply this information from the standpoint of the roentgenologist.

The first part of the book is devoted to the history of the subject and to the anatomical structure of the pulmonary segments. Their anatomical autonomy is explained in great detail and the technic of bronchographic, bronchoscopic and laminagraphic study of the segments is shown. The second part of the book describes each segment, its confines, and its relationship with other segments of the lungs. The third part shows how the knowledge of segmental anatomy is useful in interpreting pulmonary pathology, whether it involves the parenchyma, the bronchi, or the vascular elements. A detailed description of the diagnostic and therapeutic applications follows, especially regarding localized bronchography, localized application of penicillin, and segmental surgical procedures.

The book is well organized, well written, and well illustrated, and the author should be congratulated for bringing to the attention of radiologists a subject which will become more and more important in the future.

IN MEMORIAM

Percy Brown, M.D.

1875–1950

Dr. Percy Brown died on Oct. 8, 1950, at the age of 74, at his home in Egypt, Mass., about thirty miles south of Boston, where he had lived since his enforced retirement due to radiation and its sequelae. His associates knew him as a pioneer and martyr to the science of roentgenology. The latter term Percy Brown disliked when applied to himself, although he gathered the records of his colleagues and contemporaries into a book, *American Martyrs to Science Through the Roentgen Rays*. He was, indeed, a victim of the discovery he helped develop.

In his report on the 50th anniversary of his graduation from Harvard College, Dr. Brown wrote:

"About 1904, I began to notice curious changes in the structure of my fingernails and in the skin of my fingers around them. These appearances next spread generally over the skin of my hands.

"The skin of my face as well became roughened and scaly, and on the skin of both hands and face there appeared numerous warty outgrowths, which in some areas were more persistent, here and there becoming undoubtedly cancerous.

"By this time, roentgenologists and medical men in general were much concerned over such abnormalities as these, which had commenced to affect many among those engaged in x-ray research. The very serious nature of these lesions was now noted and realized.

"Such manifestations, varying in type and degree, have since been generally classified as the results of radioactivity, that subtle physical influence which has recently furnished the destructive force of the atom bomb.

"Many a scientist has suffered death as a result of this radioactive damage. Thus far, I have been fortunate enough to escape, though my physical handicaps, because of injuries, such as excisions and amputations, have been many.

"I now realize that over all these years I have probably received in divided doses, as a sort of voluntary guinea-pig in a hospital laboratory, the same deleterious effects I might have sustained in one massive explosive emanation had I been an experimental Bikini goat."

Dr. Brown was born in Cambridge, Mass., on Nov. 24, 1875, a son of Isaac Henry and Mary Elizabeth (Kennedy) Brown. He was a graduate of Browne and Nichols School and received his premedical education at the Lawrence Scientific School, now the engineering school, of Harvard. He was graduated from the Harvard Medical School in 1900, and two years later completed his internship at the Boston Children's Hospital.

During this period he became interested in the then newly discovered roentgen rays, foreseeing their important future in medical diagnostic problems. He at once gave up other branches of medical practice and devoted his entire time to working with the primitive apparatus then being used at the Children's Hospital.

In 1903, Dr. Brown organized the x-ray departments at the Children's Hospital and at the Carney Hospital, and in the same year was made "Assistant in the Use of the Roentgen Rays" at Harvard Medical School. Later, he was associated as radiologist with the Jackson Clinic in Madison, Wis., the Grunow Clinic of Phoenix, Ariz., the Western Pennsylvania Hospital at Pittsburgh, and St. Luke's Hospital, New York City. He was forced to abandon practice in the early 1920's and underwent more than fifty operations for various forms of radiation cancer.

Dr. Brown was President of the American Roentgen Ray Society in 1911 and was a major in the Medical Corps., U.S.A., in World War I. He contributed several original and historical articles to the radiological journals.

He will be remembered as having a distinct flair for descriptive English, which made his spoken speech and his writings a delight to those who knew him. He was always kindly to the younger men who came into radiology and never wished the "martyr" aspect of his life to be over-emphasized. He felt that for the good of the specialty it should be played down.

Dr. Brown was married in 1904 to Bernice Mayhew of Cambridge, who survives him.

FREDERICK W. O'BRIEN, M.D.

PERCY BROWN, M.D.

FRED S. O'HARA, M.D.

Fred S. O'Hara, M.D.

1876–1950

Dr. Fred S. O'Hara of Springfield, Ill., died at his home, on Oct. 1, 1950, following an illness of four years.

Dr. O'Hara was born on June 19, 1876, at Carbondale, Ill. He was graduated from Springfield High School in 1895 and from the Marion Sims College of Medicine in 1899. From 1910 until his retirement several years ago his entire time was devoted to the practice of radiology. From 1910 to 1927 he was radiologist at the Springfield (now Memorial) Hospital.

He served overseas during World War I and was discharged with the rank of lieutenant colonel. He was a proficient marksman and during World War II taught pistol shooting in Springfield.

Dr. O'Hara was the first president of the Western Roentgen Society. Many of the older members of the Radiological Society of North America, and especially the rapidly dwindling survivors of that group of about thirty who were charter members of its predecessor, the Western Roentgen Society, will remember how much he did to establish and maintain the objectives of the organization. The founders were determined that their society should not be competitive and that it should be truly democratic, establishing a place in organized radiology for young men, who should be encouraged to develop within the organization. A paragraph in the early constitution is still retained. It provides for members-elect, whose qualifications are the same as those of active members except that the applicant need have devoted a major portion of his time to the practice of radiology for only one year instead of three. The founders and the older members have been proud of the fact that no member, regardless of his obscurity or the modesty of his attainments, has ever been denied the right to raise his voice in either the scientific or executive sessions of the Society. The very character of the organization thus stands as a tribute to the memory of Dr. Fred S. O'Hara.

Dr. O'Hara's wife, the former Anna M. Langham, also a charter member of the Western Roentgen Society, died two years ago. He is survived by a son, Dr. G. H. O'Hara, a Springfield dentist.

ARTHUR W. ERSKINE, M.D.

RADIOLOGICAL SOCIETIES: SECRETARIES AND MEETING DATES

Editor's Note: Secretaries of state and local radiological societies are requested to co-operate in keeping this section up-to-date by notifying the editor promptly of changes in officers and meeting dates

RADIOLOGICAL SOCIETY OF NORTH AMERICA. *Secretary-Treasurer*, Donald S. Childs, M.D., 713 E Genesee St., Syracuse 2, N. Y.

AMERICAN RADIUM SOCIETY. *Secretary*, John E. Wirth, M.D., Baltimore, Md.

AMERICAN ROENTGEN RAY SOCIETY. *Secretary*, Barton R. Young, M.D., Germantown Hospital, Philadelphia 44, Penna.

AMERICAN COLLEGE OF RADIOLOGY. *Secretary*, William C. Stronach, 20 N. Wacker Dr., Chicago 6, Ill.

SECTION ON RADIOLOGY, A. M. A. *Secretary*, Paul C. Hodges, M.D., 950 East 59th St., Chicago 37.

Alabama

ALABAMA RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, W. D. Anderson, M.D., 420 10th St., Tuscaloosa.

Arizona

ARIZONA ASSOCIATION OF PATHOLOGISTS AND RADIOLOGISTS. *Secretary*, R. Lee Foster, M.D., 507 Professional Bldg., Phoenix.

Arkansas

ARKANSAS RADIOLOGICAL SOCIETY. *Secretary*, Fred Hames, M.D., Pine Bluff. Meets every three months and at meeting of State Medical Society.

California

CALIFORNIA MEDICAL ASSOCIATION, SECTION ON RADIOLOGY. *Secretary*, Sydney F. Thomas, M.D., Palo Alto Clinic, Palo Alto.

EAST BAY ROENTGEN SOCIETY. *Secretary*, Dan Tucker, M.D., 434 30th St., Oakland 9. Meets monthly, first Thursday, at Peralta Hospital.

LOS ANGELES RADIOLOGICAL SOCIETY. *Secretary*, Harold P. Tompkins, M.D., 658 South Westlake Ave. Meets monthly, second Wednesday, County Society Bldg.

NORTHERN CALIFORNIA RADIOLOGICAL CLUB. *Secretary*, Clifford W. Wauters, 701 High St., Auburn. Meets at dinner last Monday of September, November, January, March, and May.

PACIFIC ROENTGEN SOCIETY. *Secretary*, L. Henry Garland, M.D., 450 Sutter St., San Francisco 8. Meets annually with State Medical Association.

SAN DIEGO ROENTGEN SOCIETY. *Secretary*, R. F. Niehaus, M.D., 1831 Fourth Ave., San Diego. Meets first Wednesday of each month.

X-RAY STUDY CLUB OF SAN FRANCISCO. *Secretary*, Merrell A. Sisson, M.D., 450 Sutter St., San Francisco 8. Meets third Thursday at 7:45, January to June at Stanford University Hospital, July to December at San Francisco Hospital.

Colorado

COLORADO RADIOLOGICAL SOCIETY. *Secretary*, Paul E. RePass, M.D., 306 Republic Bldg., Denver 2. Meets monthly, third Friday, at University of Colorado Medical Center or Denver Athletic Club.

Connecticut

CONNECTICUT STATE MEDICAL SOCIETY, SECTION ON RADIOLOGY. *Secretary*, Fred Zaff, M.D., 135 Whitney Ave., New Haven. Meetings bimonthly, second Wednesday.

CONNECTICUT VALLEY RADIOLOGICAL SOCIETY. *Secretary*, Ellwood W. Godfrey, M.D., 1676 Boulevard, W. Hartford. Meets second Friday of October and April.

District of Columbia

RADIOLOGICAL SECTION, DISTRICT OF COLUMBIA MEDICAL SOCIETY. *Secretary*, Karl C. Corley, M.D., 1835 Eye St., N W., Washington 6. Meets third Thursday, January, March, May, and October, at 8:00 P.M., in Medical Society Auditorium

Florida

FLORIDA RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, Thos. H. Lipscomb, M.D., 30 West Beaver St., Jacksonville, 2. Meets in April and in November

GREATER MIAMI RADIOLOGICAL SOCIETY. *Secretary*, David Kirsh, M.D., 712 duPont Bldg., Miami 32 Meets monthly, last Wednesday, 8:00 P.M.

Georgia

ATLANTA RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, Ted F. Leigh, M.D., Emory University Hospital. Meets second Friday, September to May.

GEORGIA RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, Robert C. Pendergrass, M.D., Americus. Meets in November and at the annual meeting of State Medical Association.

Illinois

CHICAGO ROENTGEN SOCIETY. *Secretary*, Benjamin D. Braun, M.D., 6 N. Michigan Ave., Chicago 11. Meets at the University Club, second Thursday of October, November, January, February, March, and April at 8:00 P.M.

ILLINOIS RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, William DeHollander, M.D., St. Johns' Hospital, Springfield. Meetings quarterly as announced.

ILLINOIS STATE MEDICAL SOCIETY, SECTION ON RADIOLOGY. *Secretary*, Willard C. Smullen, M.D., St Mary's Hospital, Decatur.

Indiana

INDIANA ROENTGEN SOCIETY. *Secretary-Treasurer*, William M. Loehr, M.D., 712 Hume-Mansur Bldg., Indianapolis 4. Annual meeting in May.

Iowa

IOWA X-RAY CLUB. *Secretary*, Arthur W. Erskine, M.D., 326 Higley Building, Cedar Rapids. Meets during annual session of State Medical Society.

Kansas

KANSAS RADIOLOGICAL SOCIETY. *Secretary*, Anthony F. Rossitto, M.D., Wichita Hospital, Wichita. Meets annually with State Medical Society.

Kentucky

KENTUCKY RADIOLOGICAL SOCIETY, *Secretary*, Everett L. Pirkey, M.D., Louisville General Hospital. Meets monthly, second Friday, at Seelbach Hotel.

Louisiana

LOUISIANA RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, Johnson R. Anderson, M.D., No. Louisiana Sanitarium, Shreveport. Meets with State Medical Society.

ORLEANS PARISH RADIOLOGICAL SOCIETY. *Secretary*, Joseph V. Schlosser, M.D., Charity Hospital of Louisiana, New Orleans 13. Meets first Tuesday of each month.

SHREVEPORT RADIOLOGICAL CLUB, *Secretary*, Oscar O. Jones, M.D., 2622 Greenwood Road. Meets monthly September to May, third Wednesday.

Maine

MAINE RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, Clark F. Miller, M.D., Central Maine General Hospital, Lewiston.

Maryland

BALTIMORE CITY MEDICAL SOCIETY, RADIOLOGICAL SECTION. *Secretary*, J. Howard Franz, M.D., 1127 St. Paul St., Baltimore 2.

Michigan

DETROIT X-RAY AND RADIUM SOCIETY. *Secretary*, James C. Cook, M.D., Harper Hospital, Detroit 1. Meetings first Thursday, October to May, at Wayne County Medical Society club rooms.

MICHIGAN ASSOCIATION OF ROENTGENOLOGISTS. *Secretary-Treasurer*, R. B. MacDuff, M.D., 220 Genesee Bank Building, Flint 3.

Minnesota

MINNESOTA RADIOLOGICAL SOCIETY. *Secretary*, Leo A. Nash, M.D., 572 Lowry Medical Arts Bldg., St. Paul 2. Meets in Spring and Fall.

Missouri

RADIOLOGICAL SOCIETY OF GREATER KANSAS CITY. *Secretary*, Wm. M. Kitchen, M.D., 1010 Rialto Building, Kansas City 6, Mo. Meetings last Friday of each month.

ST. LOUIS SOCIETY OF RADIOLOGISTS. *Secretary*, H. R. Senturia, M.D., Pasteur Medical Bldg. Meets on fourth Wednesday, October to May.

Nebraska

NEBRASKA RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, John E. Downing, M.D., 816 Medical Arts Bldg., Omaha. Meets fourth Thursday of each month at 6 P.M. in Omaha or Lincoln.

New England

NEW ENGLAND ROENTGEN RAY SOCIETY. *Secretary*, L. L. Robbins, M.D., Massachusetts General Hospital, Boston 14. Meets monthly on third Friday at the Harvard Club.

New Hampshire

NEW HAMPSHIRE ROENTGEN SOCIETY. *Secretary*, Albert C. Johnston, M.D., Elliot Community Hospital, Keene. Meetings quarterly in Concord.

New Jersey

RADIOLOGICAL SOCIETY OF NEW JERSEY. *Secretary*, Peter J. Gianquinto, M.D., 685 High St., Newark 2. Meets at Atlantic City at time of State Medical Society and midwinter in Elizabeth.

New York

ASSOCIATED RADIOLOGISTS OF NEW YORK, INC. *Secretary*, William J. Francis, M.D., East Rockaway.

BROOKLYN ROENTGEN RAY SOCIETY. *Secretary*, J. Daversa, M.D., 603 Fourth Ave., Brooklyn. Meets fourth Tuesday, October to April.

BUFFALO RADIOLOGICAL SOCIETY. *Secretary-Treasurer*. Mario C. Gian, M.D., 610 Niagara St., Buffalo 1 Meetings second Monday, October to May.

CENTRAL NEW YORK ROENTGEN SOCIETY. *Secretary*, Dwight V. Needham, M.D., 608 E. Genesee St., Syracuse 10. Meetings January, May, October.

KINGS COUNTY RADIOLOGICAL SOCIETY. *Secretary*, Marcus Wiener, M.D., 1430 48th St., Brooklyn 19. Meetings fourth Thursday evening, October to May, at 8:45 P.M., in Kings County Medical Bldg.

NEW YORK ROENTGEN SOCIETY. *Secretary*, John L. Olpp, M.D., 49 Ivy Lane, Tenafly, N. J.

QUEENS ROENTGEN RAY SOCIETY. *Secretary*, Jacob E. Goldstein, M.D., 88–29 163rd St., Jamaica 3. Meets fourth Monday of each month.

ROCHESTER ROENTGEN-RAY SOCIETY. *Secretary-Treasurer*, A. Vaughn Winchell, M.D., 40 Meigs St. Meets at Strong Memorial Hospital, last Monday of each month, September through May.

North Carolina

RADIOLOGICAL SOCIETY OF NORTH CAROLINA. *Secretary*, James E. Hemphill, M.D., Professional Bldg., Charlotte 2. Meets in May and October.

North Dakota

NORTH DAKOTA RADIOLOGICAL SOCIETY. *Secretary*, Charles Heilman, M.D., 807 Broadway, Fargo.

Ohio

OHIO STATE RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, Edward C. Elsey, M.D., 927 Carew Tower, Cincinnati 2. Meets with State Medical Association.

CENTRAL OHIO RADIOLOGICAL SOCIETY. *Secretary* Frank A. Riebel, M.D., 15 W. Goodale St., Columbus. Meets second Thursday, October, December, February, April, and June, 6:30 P.M., Columbus Athletic Club, Columbus.

CLEVELAND RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, John R. Hannan, M.D., 10515 Carnegie Ave., Cleveland 6. Meetings at 6:45 P.M. on fourth Monday, October to April, inclusive

GREATER CINCINNATI RADIOLOGICAL SOCIETY. *Secretary*, Lawrence Gibboney, M.D., Carew Tower Bldg. Meets first Monday, September to May.

MIAMI VALLEY RADIOLOGICAL SOCIETY. *Secretary*, Geo. A. Nicoll, M.D., Miami Valley Hospital, Dayton. Meets monthly, second Friday.

Oklahoma

OKLAHOMA STATE RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, W. E. Brown, M.D., 21st and Xanthus, Tulsa 4. Meets in October, January, and May.

Oregon

OREGON RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, C. Todd Jessell, M.D., 224 Medical-Dental Bldg., Portland 5. Meets monthly, on the second Wednesday, at 8:00 P.M., in the library of the University of Oregon Medical School.

Pacific Northwest

PACIFIC NORTHWEST RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, Sydney J. Hawley, M.D., 1320 Madison St., Seattle 4. Meets annually in May.

Pennsylvania

PENNSYLVANIA RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, James M. Converse, M.D., 416 Pine St., Williamsport 8. Meets annually.

PHILADELPHIA ROENTGEN RAY SOCIETY. *Secretary*, George P. Keefer, M.D., American Oncologic Hospital, Philadelphia 4. Meets first Thursday of each month at 8:00 P.M., from October to May, in Thomson Hall, College of Physicians, 21 S. 22nd St.

PITTSBURGH ROENTGEN SOCIETY. *Secretary-Treasurer*, Edwin J. Euphrat, M.D., 3500 Fifth Ave., Pittsburgh 13. Meets monthly, second Wednesday, at 6:30 P.M., October to May, at Webster Hall.

Rocky Mountain States

ROCKY MOUNTAIN RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, Maurice D. Frazer, M.D., Lincoln Clinic, Lincoln, Nebr.

South Carolina

SOUTH CAROLINA X-RAY SOCIETY. *Secretary-Treasurer*, S. H. Fisher, M.D., 107 E. North St., Greenville. Meets with State Medical Association in May.

South Dakota

RADIOLOGICAL SOCIETY OF SOUTH DAKOTA. *Secretary-Treasurer*, Marianne Wallis, M.D., 1200 E. Fifth Ave., Mitchell. Meets with State Medical Society.

Tennessee

MEMPHIS ROENTGEN CLUB. Meetings second Tuesday of each month at University Center.

TENNESSEE RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, J. Marsh Frère, M.D., 707 Walnut St., Chattanooga. Meets annually with State Medical Society in April.

Texas

DALLAS-FORT WORTH ROENTGEN STUDY CLUB. *Secretary*, X. R. Hyde, M.D., Medical Arts Bldg., Fort Worth 2. Meets monthly, third Monday, in Dallas odd months, Fort Worth even months.

HOUSTON X-RAY CLUB. *Secretary*, Curtis H. Burge, M.D., 3020 San Jacinto, Houston 4. Meetings fourth Monday of each month.

TEXAS RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, R. P. O'Bannon, M.D., 650 Fifth Ave., Fort Worth. Next meeting, Jan. 19–20, 1951, in Galveston.

Utah

UTAH STATE RADIOLOGICAL SOCIETY. *Secretary-Treasurer*, Angus K. Wilson, M.D., 343 S. Main St., Salt Lake City. Meets third Wednesday, January, March, May, September, November.

Virginia

VIRGINIA RADIOLOGICAL SOCIETY. *Secretary*, P. B. Parsons, M.D., Norfolk General Hospital, Norfolk.

Washington

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ROENTGEN DIAGNOSIS

THE HEAD AND NECK

A Roentgenological Study of the Metopic Suture. Johan Torgersen. Acta radiol. **33:** 1–11, January 1950.

The metopic suture is the persistent mediofrontal suture which ordinarily closes before the age of two years. It is a normal variation and behaves as the other sutures with regard to closure, showing the same sex differences. It is not visible roentgenographically if the inner table is closed and if there is no sclerosis along the suture.

In the presence of this anomaly the forehead tends to be broad, with an increased curve of the frontal bone and bulging of the frontal tuberosities. The roof of the nose is low and the distance between the eyes is somewhat increased. The shape of the forehead and face is established during the period in which the mediofrontal suture is open. Even a slight delay in obliteration of this suture will result in a metopic skull. This same conformation of the forehead and face is seen in cretins, which serve as an example of the metopic skull without persistence of the metopic suture. The frontal sinuses in persistent metopic suture are small as in cretinism. A probable relationship between cretinism and persistent suture is suggested.

Four roentgenograms; 1 photograph.

JACK WIDRICH, M.D.
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Surgical Treatment of Aneurysm of the Anterior Cerebral and of the Anterior Communicating Arteries Diagnosed by Angiography and Electroencephalography. Arthur R. Elvidge and William H. Feindel. J. Neurosurg. **7:** 13–32, January 1950.

Surgical treatment of aneurysms of the anterior cerebral and anterior communicating arteries may consist in ligation of either the common or internal carotid artery or in a direct operative approach. The authors report two cases in which aneurysms were demonstrated by stereoscopic angiography, and a direct surgical approach was employed. One was an aneurysm of the anterior communicating artery treated by trapping and clipping; the other was an aneurysm of the right anterior cerebral artery which was clipped and excised.

A brief discussion of cerebral angiography is given. The authors use thorotrast or diodrast. Diodrast is used in concentrations of 45 per cent if the vessel is exposed or 35 per cent if the percutaneous method is used. Accelerated respiration and, unless sedation is employed, twitchings or an epileptic seizure may result from the use of diodrast. It is felt that the iodine preparations may permeate through the vessel wall and give rise to vascular spasm or epileptic manifestations.

The precise nature, localization, size and communications of the lesion may be determined by angiography. Pneumography, while of considerable value in the diagnostic work-up, may actually indicate the wrong side by giving the localization of the retained hemorrhage, which may extend for some distance from the actual source of the bleeding.

The electroencephalogram was correct as to the side of the lesion in both the cases here recorded.

Twelve figures, including 10 roentgenograms.

HOWARD L. STEINBACH, M.D.
University of California

THE CHEST

The Bronchopulmonary Segments. Harold L. Temple and John A. Evans. Am. J. Roentgenol. **63:** 26–46, January 1950.

The development of thoracic surgical technics has increased the importance of precise identification of the bronchopulmonary segments, but differences in terminology have resulted in some confusion in this respect. The authors consider the nomenclature suggested by Jackson and Huber (Dis. of Chest **9:** 319, 1943) as best suited to meet the practical needs of all medical specialties. This classification divides the lungs into ten major segments on the right and eight on the left.

The right upper lobe bronchus divides into three segments: apical, posterior, and anterior. Consolidation of the *right apical segment* is seen in postero-anterior projection as a dense opacity occupying the apex of the lung. In the lateral view the shadow extends from the apex to the region of the hilus in the shape of a V. Collapse of this segment is visualized with difficulty. The only roentgen evidence may be a very slight widening of the superior mediastinum in the postero-anterior view.

Consolidation of the *right posterior segment* on the postero-anterior film simulates that of the anterior segment. The greatest density is peripheral and the medial border is indistinct. The lower border runs horizontally and the upper border is oblique. On the lateral view the shadow is quadrilateral in outline. The lower border is delimited by the oblique fissure. Partial collapse of this segment is well defined in the lateral view. In complete collapse, only a very narrow linear shadow is seen, which may be mistaken for thickening of the lobar fissure.

The *right anterior segment*, when consolidated, appears as a roughly quadrilateral density extending from the hilus to the anterior axillary line. The lower border is sharply defined by the transverse fissure. In the lateral projection consolidation is seen as an anterior wedge-shaped density with the apex pointing to the hilus. Collapse of this segment reduces the size and extent of the shadow in direct proportion to the degree of collapse.

The right middle lobe bronchus divides into medial and lateral segmental bronchi, supplying the two major segments of the lobe. Consolidation of the *right lateral segment* appears as a roughly triangular density in the lateral half of the right mid-lung field. Its upper border lies on the transverse fissure, and the medial border is indistinct. In the lateral view the shadow is triangular, extending forward and downward from the hilus with a rather sharply delimited anterior margin. The posterior margin rests on the oblique fissure. Collapse of this segment appears in the postero-anterior view as an ill-defined density just below the lateral half of the depressed transverse fissure.

Consolidation of the *right medial segment* is seen as a quadrangular density in apposition with the right heart border and extending about half way across the lung field. The lateral view shows the density to be triangular in shape with its base against the anterior chest wall and a fading apex at the hilus. It may be difficult to differentiate collapse of this segment from collapse of the entire lobe, since in both instances the right heart border is obscured.

The *superior segment of the right lower lobe*, when consolidated, appears as a large semicircular shadow lying in apposition to the heart border. The upper border is convex and the lower border is horizontal or slightly concave. In the lateral view the density has a characteristic triangular outline with its base on the posterior chest wall and apex at the mid-axillary line. Collapse of this segment on the postero-anterior view is seen as a rather small parahilar shadow; in the lateral view it produces a narrow wedge-like opacity.

Consolidation of the *posterior basal segment* appears in the postero-anterior view as a dense shadow obliterating the cardiophrenic angle. In the lateral view the segment is seen as a triangular opacity with its apex at the hilus and the base in the posterior costophrenic sulcus. Collapse of the segment reduces the size of the shadow in the postero-anterior view. In the lateral view the triangular shadow is replaced by a long narrow band.

Consolidation of the *lateral basal segment* occupies the same location in both views as that of the *anterior basal segment*. In the latter, consolidation is demonstrable as a cuneiform opacity with the base resting on the lateral half of the diaphragm, partially obscuring the costophrenic sulcus. The apex is at the hilus. In the lateral view a characteristic wide band-like density is seen extending from the hilus to the anterior portion of the diaphragm. The anterior border is sharply defined by the lower half of the oblique fissure. Collapse of this segment is manifested in the postero-anterior view by a patchy density in the region of the lateral portion of the basal lung field above the costophrenic angle. Laterally it is apparent as a narrow band-like density along the interlobar fissure.

Medial basal segment consolidation is seen as a density with the base on the diaphragm and apex at the hilus, situated in the cardiophrenic angle. In the lateral exposure it appears as a small triangular density with its base resting on the mid-portion of the diaphragm and apex pointing upward toward the hilus. Collapse of this segment is usually hidden by the heart shadow in the postero-anterior view but is seen on the lateral film as a narrow band running vertically downward from the hilus to about the mid-portion of the diaphragm.

Since the *apical posterior segment of the left lung* is the equivalent of the apical and posterior segments of the right lung, consolidation is seen in the postero-anterior roentgenogram as a large homogeneous density obscuring the apex of the lung above the circle of the first rib and extending down to the hilus. In the lateral projection the shadow is seen to occupy the apex and posterior parts of the upper chest and to be superimposed on the shadow of the shoulder girdle.

The *left anterior segment* is similar in all respects to its counterpart on the right.

The *lingular division* is the equivalent of the left middle lobe.

The *left lower lobe* is analogous to the right lower lobe except that the medial basal segment is combined with the anterior basal, as they have a common bronchus.

Forty-six roentgenograms.

ROBERT A. HAYS, M.D.
Cleveland Clinic Foundation

The Oblique View in Bronchographic Study. P. Galy and J. Papillon. J. franç. de méd. et chir. thorac. **4:** 69–70, 1950. (In French)

At times it is deemed helpful to study bronchographically both sides of the bronchial tree, as in determining the amount of healthy tissue in bronchiectasis. In such cases lipiodol may be injected on the side believed to be most extensively involved, and posterior and lateral views obtained. The other side may then be filled and an oblique view obtained. This technic is useful in separating the two sides and in denoting relative anterior or posterior involvement by disease.

Two roentgenograms.

CHARLES NICE, M.D.
University of Minnesota

Successful Removal of Lower Accessory Lung. Michael DeBakey, J. B. Arey, and R. Brunazzi. J. Thoracic Surg. **19:** 304–311, February 1950.

Lower accessory lung is an extremely uncommon anomaly, only about 40 cases in human beings having been reported. Its origin is rather obscure, but it is most generally believed that it arises during embryonic life by separation of a part of the primitive pulmonary anlage from the remainder of the lung.

The authors describe the case of a seven-year-old Negro girl with roentgen evidence of a large tumor at the base of the left lung posteriorly. The chest film was made for an acute inflammatory condition, and the "tumor" was an incidental finding. Preoperative diagnosis was a dermoid or pulmonary cyst. The mass, measuring about 8 cm. in diameter, was located between the diaphragm and lower lobe, with a comparatively narrow vascular pedicle which was definitely attached to the systemic and not the pulmonic system. Pathologically the mass consisted of a large cyst containing thick greenish-yellow fluid, lined by pseudostratified columnar epithelium, accompanied by mucous glands and plaques of hyaline cartilage. There were also epithelialized and non-epithelialized spaces resembling pulmonary alveoli. Following operation the child made an uneventful recovery.

Included also is a description of a similar case in a stillborn fetus.

Five illustrations, including 2 roentgenograms.

HAROLD O. PETERSON, M.D.
University of Minnesota

Actinomycosis Pneumonia. B. Lindemann. Fortschr. a. d. Geb. d. Röntgenstrahlen **71:** 727–735, September 1949. (In German)

The pneumonic type of actinomycosis can occur primarily or secondarily, the former being relatively more frequent. A productive interstitial form and an exudative type of the disease are observed, making the differentiation from tuberculosis rather difficult.

The pneumonic type of actinomycosis may (1) resolve without residual pulmonary changes; (2) give rise to abscesses with extensive scar formation, fibrosis and adhesions; (3) develop into a chronic "carnifying" pneumonia with fistula and abscess formation.

In the case of abscess formation, the actinomycosis may extend into the spine, ribs, or pelvis, with production of paravertebral and subdiaphragmatic abscesses.

Three case reports are given, with 9 roentgenograms.

EUGENE F. LUTTERBECK, M.D.
Chicago, Ill.

Residual Cavities in Pulmonary Coccidioidomycosis: Follow-up Studies. Rudolph Berke, Alexander Schomer and Hyman E. Bass. Dis. of Chest **17:** 84–91, January 1950.

A series of 4 cases of coccidioidal pulmonary cavitation is presented.

Emphasis is placed on the residual cavities in these cases as distinguished from residual nodular densities because of the importance of differentiation from other pulmonary conditions, especially tuberculosis. The authors' patients gave a history of residence from five to seven years earlier in an endemic area. The clinical course was benign, and the roentgen appearance showed little or no change over a period of several years.

Non-intervention is the keystone of therapy of the residual lesions of coccidioidomycosis.

Four roentgenograms; 1 photograph.

STANLEY H. MACHT, M.D.
Hagerstown, Md.

Bronchopulmonary Geotrichosis in Children. Ralph H. Kunstadter, Albert Milzer, and Frances Whitcomb. Am. J. Dis. Child. **79:** 82–90, January 1950.

Geotrichum, a fungus resembling *Blastomyces dermatitidis* and *Coccidioides immitis*, may produce infections of the skin and mucous membranes, or of the lungs, simulating tuberculosis. Other conditions from which a differentiation must be made include coccidioidomycosis, histoplasmosis, moniliasis, blastomycosis, and cryptococcosis.

The pulmonary lesions are not characteristic of any specific mycosis. Thin-walled cavities may develop or the infiltrates may appear as soft, mottled, or irregular patchy areas scattered throughout both lung fields. Hilar adenopathy is present and may persist for some time after the pulmonary lesions have resolved. A chronic bronchitis with peribronchial thickening and without parenchymal infiltrates may be present.

Clinically the constitutional symptoms are not severe in proportion to the degree of pulmonary involvement. Cough, low-grade fever, and anorexia are usually present. Patients with symptoms of chronic bronchitis or pulmonary tuberculosis who have white, mucoid sputum containing grayish flakes should be suspected of having an infection with Geotrichum. The organism can be cultured on Sabouraud's medium. A positive skin reaction to the Geotrichum antigen may be obtained.

The authors investigated a family in which all 5 members reacted positively to the Geotrichum skin test. Two of the children had soft mottled infiltrations in both lungs and hilar adenopathy. In the first child a provisional diagnosis of tuberculosis was made, but the tuberculin test was negative and the Geotrichum test was positive. There was no improvement with streptomycin, but iodide therapy produced a favorable response in both children.

It is believed that many cases of pulmonary mycotic disease go undiagnosed because of the failure to culture the sputum of patients with chronic bronchial infections and atypical or bizarre pneumonic infiltrations.

Nine roentgenograms; 2 tables.

MORTIMER R. CAMIEL, M.D.
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Pulmonary Function Studies in Bituminous Coal Miners. Hurley L. Motley. West Virginia M. J. **46:** 8–23, January 1950.

Measurements of ventilation, emphysema, and respiratory gas exchange were obtained in 56 bituminous coal miners with anthracosilicosis and compared with previous studies by the author and his associates on anthracite coal miners (see, for example, Am. Rev. Tuberc. **59:** 270, 1949). The studies on pulmonary function revealed physiological disturbances quite similar to those in anthracite miners with anthracosilicosis.

No apparent relationship could be established between the stage of silicosis as estimated from the roentgenogram and degree of pulmonary emphysema. In this respect, also, the findings were similar to those in the anthracite series.

Sixteen roentgenograms; 4 charts; 5 tables.

Pulmonary Oedema and the "Batswing" Shadow. C. J. Hodson. J. Faculty Radiologists **1:** 176–186, January 1950.

The author reports 6 examples of bat's-wing shadow, known also as butterfly edema or uremic pneumonia. The case histories are presented with reproductions of 15 roentgenograms, which are of good quality despite the fact that all of the patients were extremely ill and the films were obtained by means of a mobile unit.

The bat's-wing shadow occurs almost invariably in association with severe dyspnea complicating an illness in which strain is thrown on the left heart. It may start as a solid-looking area in the central lung fields, with rather ill-defined edges, or the edges may be well defined. It may be unilateral or bilateral; it may be limited to a small area of one lung or occupy the major portions of one lung or both lungs; it may spread to a fresh area either in the original or opposite lung. It may occur with the congestive type of pulmonary edema or alone, accompanied only by congested vessels.

The central or perihilar portions of the lung are involved, irrespective of pulmonary segments, fissures, or lobes, and gravity does not appear to be an influence. A feature which is said to be characteristic is that the process does not reach to the lung periphery but leaves a clear zone next to the chest wall, corresponding to normal lung tissue. Clearing requires two days to a week or more and bears no constant relationship to raised temperature or leukocytosis.

The author's six cases included 2 of acute nephritis, 2 of hypertensive heart failure of different grades and 2 of malignant hypertension secondary to polyarteritis nodosa. The mechanism of formation of the pulmonary lesion is obscure, but it is pointed out that it can occur in the absence of an appreciably raised blood urea level and has a much stronger association with left ventricular failure.

GLENN F. MILLER, M.D.
The Henry Ford Hospital

Pulmonary Abscess as Complication of Hiatal Hernia. Eugene L. Coodley. Dis. of Chest **17:** 102–113, January 1950.

The author presents an unusual case of lung abscess secondary to a hiatal hernia of the left diaphragm. The patient was a 57-year-old white male who had a severe episode of vomiting, coughing and dyspnea seven weeks prior to hospital admission. Treatment with penicillin, sulfadiazine and insulin resulted in gradual improvement, with complete recovery after a three-month period. Serial chest films showed the course of the disease and a gastro-intestinal study demonstrated a large hiatal hernia.

It is postulated that the abscess in this case was due to aspiration of stored material from the hernia, at the time of the severe episode of vomiting. This is borne out by the demonstration of areas of plate-like atelec-

tasis on the admission chest film, probably due to the plugging of small bronchi at the time of aspiration. Further, it may be assumed that in one of these atelectatic areas secondary infection developed, giving rise to a silent lung abscess manifested only by systemic signs up to the time of entry. The roentgenogram at that time showed a circumscribed dense area with a radiolucent center at the apex of the left lower lobe. Shortly after hospitalization, rupture of the abscess was initiated by another episode of vomiting, and bronchogenic dissemination occurred. Pneumonic areas appeared in both lung fields, and the abscess cavity was no longer demonstrable.

A review of the etiology and pathogenesis of pulmonary abscesses is given. The roentgen picture shows three stages. Early findings simulate a pneumonitis, except that two lobes are often involved; in the pyogenic cavity stage, air and fluid levels are demonstrable if there is communication with a bronchus; the third stage may be one of resolution, the abscess may become larger and chronic with a thick-walled cavity predominating, or a large fibrous ring may be left around the entire area, so that a large empty space results.

Present concepts of medical therapy and indications for surgical intervention are discussed.

Seven roentgenograms.

STANLEY H. MACHT, M.D.
Hagerstown, Md.

Bed Rest, Collapse, and Streptomycin in the Treatment of Pulmonary Tuberculosis. I. Clinical and Roentgenologic Observations (A Preliminary Report). Bruce W. Armstrong, John P. Colmore, and James E. Drorbaugh. Dis. of Chest **17:** 11–32, January 1950.

This report is a comprehensive analysis of 77 cases of pulmonary tuberculosis treated by a combination of streptomycin, collapse therapy, and bed rest in a U. S. naval tuberculosis center. Positive cultures of the sputum or gastric contents were obtained in all cases.

Most of the patients received 1.0 gm. of streptomycin daily for six weeks following an observation period during which time the disease progressed, failed to improve, or improved less than was expected. A jury of specialists—one phthisiologist, one pathologist, and one thoracic surgeon—analyzed the results. It was found that 71 per cent of the cases showed roentgenologic improvement after streptomycin therapy, 83 per cent showed clinical improvement, and 59 per cent showed both roentgen and clinical improvement greater than could have been expected without streptomycin.

The cases were divided into seven pathological types, and an attempt was made to correlate the clinical, roentgenologic, and bacteriologic response to streptomycin therapy in each type.

In correlating the observed effects of streptomycin therapy as noted on chest roentgenograms with the known pathological changes, the most striking effect noted was the rapid clearing of "soft" exudative spreads. This is probably due to dissolution of the perifocal reaction about areas of caseous lobular pneumonia.

The favorable response of confluent tuberculous lobular pneumonia (tuberculosis pneumonia) was particularly striking, and is due both to the clearing of the perifocal reaction and to the stimulation of the production of collagen by the invading productive elements. It is felt that these two factors are of great importance in aborting the extension of the caseation necrosis with its subsequent liquefaction and massive excavation which so often follow in natural sequence in untreated cases.

Acinous nodose foci, which appear roentgenographically as the nodular type of transbronchial dissemination, do not show so dramatic a decrease in size as do the "softer" areas of caseous lobular pneumonia. This is probably due to the paucity of perifocal reaction which surrounds these lesions in their natural state.

There has been considerable discussion regarding the ability of streptomycin to close cavities. The authors believe that many of the cavity closures observed following streptomycin therapy are more apparent than real. A cavity is visualized roentgenographically because the components of the cavity wall, surrounded by a zone of perifocal reaction, produce an annular shadow on the roentgenogram which contrasts with the remainder of the lung fields. The effect of streptomycin on the relatively evanescent perifocal reaction will produce a rapid resolution which will increase the difficulty of visualizing the cavity.

Twenty-one roentgenograms; 8 charts; 2 tables.

STANLEY H. MACHT, M.D.
Hagerstown, Md.

Pulmonary Tuberculosis in the Mental Hospitals of Western Australia. Frank Prendergast and Alan King. M. J. Australia **1:** 78–79, Jan. 21, 1950.

In four hospitals in Western Australia, 1,445 mental patients were surveyed for tuberculosis. The initial survey was made with 35-mm. film, followed by examination with 14 × 17-inch films in all suspected or definite cases. Fifty-three patients were found to have active tuberculosis (3.7 per cent) and 32 inactive (2.2 per cent); 1.2 per cent are listed as suspicious. The hospital personnel were also surveyed, showing an incidence of only 0.3 per cent.

As in other reported surveys, schizophrenia was associated with tuberculosis more often than other mental illnesses. The opposite was found to be true with epilepsy, only one case being discovered among 60 patients, and that one inactive.

Treatment consisted in increasing rest, if possible, and careful isolation.

ZAC F. ENDRESS, M.D.
Pontiac, Mich.

Temporary High Position of the Diaphragm. L. Meyler and Eelco Huizinga. J. Thoracic Surg. **19:** 283–291, February 1950.

The authors state that they have seen in the last few years a dozen patients with temporary elevation of the diaphragm following extirpation of the gallbladder or cholecystitis or in patients with pulmonary disease or pleurisy. In each instance it was the right diaphragm that was involved. Six illustrative cases are reported.

Bronchography was performed in selected cases and revealed evidence of compression or collapse of the basal portion of the lower lobe quite consistently. There was never any evidence of restriction upon the lower lobe. From this experience the authors question the therapeutic soundness of paralyzing the diaphragm in cases of apical tuberculosis. In every case where the high diaphragm was due to gallbladder disease or a pleural or pulmonary lesion, it returned to normal within a few days or weeks.

Eight roentgenograms.

HAROLD O. PETERSON, M.D.
University of Minnesota

Apex Tumors of the Lung (Pancoast Syndrome). M. Barabás and J. Lendvai. Radiol. clin. **19:** 36–50, January 1950. (In German)

The apical chest tumors, originally described by Pancoast as "superior pulmonary sulcus tumors," are now generally called apex tumors. They can arise either from the apex of the lung or from surrounding extrapulmonary tissues. The greatest number have been proved to be bronchogenic carcinoma. The clinical syndrome is constant and independent of the origin of the growth or its histologic nature.

All published cases have shown a tumor involving the extreme apex of the lung on one side only. This spreads evenly in all directions, shows a more or less sharply demarcated convex lower border, and in many cases extends upward into the supraclavicular region. The density is usually homogeneous or slightly irregular. The bones in the immediate vicinity are eroded, particularly the ribs and cervical vertebrae. Very often neither x-ray nor clinical signs are observed during the early stages.

The authors divide the x-ray appearance into three stages:

1. A small apical shadow not very dense with concave lower border. There may be small peripheral areas of secondary necrosis, causing relatively clear shadows.
2. Increase in size and density but as yet no bone destruction.
3. Bone destruction with a soft-tissue shadow in the supraclavicular area.

Five cases are described, each conforming to the general pattern both clinically and radiologically. As each case came to autopsy it was ascertained that the tumor originated in the lung apex. Each proved histologically to be a bronchogenic carcinoma. The clinical features of these cases are described and the differential points between apical tumor and early infectious processes are discussed. In the latter, density is less homogeneous; contour is more irregular; necrosis, when present, is usually central and appears earlier; surrounding areas may show inflammatory and atelectatic changes; there is less pain or none whatever; acid-fast organisms may be found in sputum or gastric contents.

In the first stage and early second stage of apical tumors lobectomy may be of value. In all other stages, x-ray therapy has been found useful as a palliative measure.

Eleven illustrations, including 8 roentgenograms.

EDGAR SPACKMAN, M.D.
Fort Worth, Texas

Metastatic Tumors of the Lung. Jerome L. Marks. Dis. of Chest **17:** 63–73, January 1950.

In a necropsy series of 1,303 tumors of various origin (Turner and Jaffe: Am. J. Roentgenol. **43:** 479, 1940) the incidence of lung metastases averaged 26.6 per cent. Neuromuscular, skeletal, glandular, and hemopoietic tumors produced 50 per cent of the pulmonary metastases; the urinary tract, genitals, gastro-intestinal and respiratory tracts 25 per cent; and tumors of the oral cavity about 10 per cent.

The avenues of metastasis are through the circulation, the lymphatics, and the membranous surfaces. Neoplasms of the bones and kidneys metastasize through the general systemic venous system, while those from the stomach and colon metastasize through the portal system. Metastases from the prostate occur *via* the vertebral vein plexus. Carcinomas of the breast and stomach metastasize through the thoracic duct and the cisterna chyli and through the right lymphatic duct. Carcinomas of the ovary and bladder may metastasize to local membranous surfaces and then to the lungs.

The author believes that characteristic roentgen manifestations can be anticipated in blood-borne and lymphatic metastases.

A. The Circulatory or Hematogenous Pattern: The filtering mechanism of the rich capillary network of the lungs produces lesions of two main types, manifested by (1) a solitary nodular shadow, which may be either small or large, and (2) a multiple nodular group of shadows, which may vary from miliary to huge cannonball types. The solitary nodular metastasis is considered the most difficult pulmonary lesion to differentiate, and a table outlining the differential diagnosis is supplied. A routine procedure for this differential diagnosis of the solitary nodular type of lesion is also presented. Another table presenting the differential diagnosis of multiple nodular shadows is given.

B. The Lymphatic Pattern: In order to understand the roentgen picture of lymphangitic metastases one has to know the anatomical lymphatic drainage of the lung. Each lung has 3 areas of lymphatic drainage: superior, middle, and inferior.

Right Lung

1. Superior area: Right laterotracheal nodes.
2. Middle area: Right laterotracheal nodes; intertracheobronchial nodes.
3. Inferior area: Bifurcation nodes.

Left Lung

1. Superior area: Left laterotracheal nodes; anterior mediastinal nodes; subaortic nodes.
2. Middle area: Anterior mediastinal nodes; laterotracheal nodes; bifurcation nodes.
3. Inferior area: Bifurcation nodes.

The lymphatics of the parietal pleura empty into the lateral precardiac and anterior mediastinal nodes on the left and the posterior mediastinal on the right. The posterior portion of the diaphragm connects with the subperitoneal lymphatics which terminate in the abdominal para-aortic nodes. They also empty into the lymphatics of the liver, into those of the capsule of the kidney and of the suprarenal gland.

Roentgenologically lymphangitic spread appears as a diffuse string-like formation of increased density radiating out from the hilus to the periphery. This is usually heaviest in the central and basal portions of the lung but may extend into the periphery and also into the upper portions of the lung. The lymphatic spread may be unilateral if it starts from an intrapulmonary tumor.

Ten illustrations, including 7 roentgenograms; 6 tables.

STANLEY H. MACHT, M.D.
Hagerstown, Md.

The Pulmonary Manifestations of Scleroderma: An Anatomic-Physiological Correlation. David M. Spain and Albert G. Thomas. Ann. Int. Med. **32:** 152–161, January 1950.

The authors recently observed a case of scleroderma in which the clinical features were almost entirely related to the lungs. A correct diagnosis was made during life, and extensive cardiopulmonary physiologic

studies were performed. Necropsy permitted a correlation of anatomic and functional findings.

Getzowa (Arch. Path. **40:** 99, 1945), whose report on pulmonary manifestations of scleroderma is probably the most detailed, describes two main types of change. The first, described as a cystic sclerosis, begins with hyaline fibrotic change in the interstitium of the pulmonary parenchyma. Subsequently disappearance of the capillaries occurs with a diffuse superimposed fibrosis of the alveolar walls. A dissolution then follows in many of these alveolar walls, with the formation of cysts of varying sizes. The second type of change is a compact pulmonary sclerosis, in which the alveolar walls are thickened and the alveoli gradually reduced in size. Many small alveoli are then contained within zones of compact fibrous tissue. An associated change is a bronchiolar hyperplasia, sometimes assuming an adenoma-like appearance. An additional finding in the authors' case was widespread bronchiolectasis, which has also been noted by others.

The functional changes in scleroderma of the lungs involve ventilation and respiration. The most striking changes are noted in the impairment of respiratory function. The thickening of the alveolar walls, the narrowing of the lumina, the thickening of the vascular walls, and the obliteration of many of the vessels are adequate to explain the interference with the exchange of gas over the alveolar interface.

One roentgenogram; 2 photomicrographs.

STEPHEN N. TAGER, M.D.
Urbana, Ill.

Surgical Tumors of the Mediastinum. P. Santy, M. Bérard, and P. Galy. J. franç. de méd. et chir. thorac. **4:** 1–37, 1950. (In French)

This paper deals with the incidence of the various pathological types of mediastinal tumor and the diagnostic problems encountered. Since it is essentially based on surgical reports, patients with diseases of lymph nodes and the great vessels have been largely excluded.

Tumors of nervous origin arose in the posterior mediastinum in 20 of 22 cases. Distribution in the superior, middle and inferior portions of the mediastinum was about equal. Malignancy is suggested by tumors in children (malignant sympathetic nervous tumors), by rapid tumor growth, by intense neurologic pain, and by invasion and destruction of the ribs. Tumors of Recklinghausen's neurofibromatosis may at times undergo malignant change.

Under the term "dysembryoma" are classified heteroplastic dysembryomas (teratomas and dermoid cysts) and homoplastic dysembryomas (bronchogenic or esophageal cysts). Two of 13 such cases were malignant and exhibited rapid growth.

Bronchogenic cysts usually occur in the middle mediastinum. Pleuropericardial cysts result from defects in proper closure of the primitive celomic cavity; they usually arise in the anterior costodiaphragmatic sinus.

Fibromas may occur in various parts of the mediastinum. Many fibromas, especially in the posterior mediastinum, actually arise from nerve sheaths.

The majority of thymic tumors are malignant, and invasion of surrounding tissues (sternum, nerves) or secondary deposits in the cervical nodes preclude surgical excision. Two cystic tumors of the thymus were actually teratomatous.

Some malignant tumors of the mediastinum are of indeterminate origin. These include sarcomas and undifferentiated epitheliomas.

Numerous "pseudotumoral" formations necessitated thoracotomy. One case of ectasia of the left auricle simulated a pedunculated cyst. Another proved to be an aneurysm of the descending aorta which simulated an hourglass form of nervous tumor. Still another proved to be a non-syphilitic aneurysm of the brachiocephalic trunk.

Lymph node tumors and tuberculous nodes at times resemble benign tumors.

Clinical diagnosis by location has long been used to identify posterior mediastinal tumors as being of nervous origin, while dermoid cysts are usually considered to be anterior. It is not always so simple. Some mediastinal tumors grow to large dimensions, and some pulmonary tumors appear to be of mediastinal origin.

In clinical identification of mediastinal tumors one should first determine location: anterior or posterior; superior, middle, or inferior. Nervous tumors arising in the phrenic nerve may be anterior. Posterior tumors presenting an hourglass form, involving intraspinal and extraspinal space, and those associated with generalized neurofibromatosis are usually of nervous origin. Meningoceles occasionally mimic these tumors. Thyroid tumors may present posteriorly. Dysembryomas are usually anterior and are usually accompanied by signs of mediastinal compression, cough, or hemoptysis.

In considering the superior mediastinum, it is difficult to determine whether a tumor originated anteriorly or posteriorly. Examination of the tissues above the sternum and clavicles may reveal a thyroid or lymphoid tumor. Thymic tumors are frankly retrosternal, grow rapidly, and invade surrounding tissues. In the postero-anterior view the tumor is often seen on both sides of the sternum. It is frequently difficult to determine the posterior origin of nervous tumors. Aneurysms of the large brachiocephalic vessels should be kept in mind.

At the mid-mediastinal level, diverse tumors are encountered. Bronchogenic cysts are found at the tracheal bifurcation. Lymph node tumors and tuberculous nodes may be multiple and yet appear as single tumors, especially on tomograms. Pseudo-tumors, such as ectasia of the left auricle and aneurysms of the great vessels, may be confusing. Angiocardiography is of aid in these cases.

At the level of the inferior mediastinum one encounters pleuropericardial cysts and gastrogenous cysts. Here also are seen malformations of the esophagus, hiatus hernia, colonic hernia, the posterior nervous tumors, anterior dysembryomas, aneurysmal dilatation of the descending aorta, and pericardial diverticulum. Multiple views and barium studies are indicated.

Cases in which a diagnosis of resectable tumor seems likely or cannot be excluded call for surgery.

Twenty-seven roentgenograms; 5 photographs.

CHARLES NICE, M.D.
University of Minnesota

Differential Diagnosis of Mediastinal Tumors by Cinédensigraphy. Maurice Marchal. J. franç. de méd. et chir. thorac. **4:** 102–112, 1950.(In French)

The author believes that "cinédensigraphy" offers a simple solution to the problem of differentiating mediastinal tumors. A photoelectric cell is placed between the patient and the fluoroscopic screen, and by electronic amplification changes in density are registered on

photographic paper with a simultaneous electrocardiographic tracing.

The major principle involved in differentiating tumors from vascular abnormalities is based on the fact that aneurysms or ectasias present a characteristic expansive pulsation which does not change with (1) the position of the patient, (2) the phase of respiration, or (3) the topography of the photo-electric cell. Tracings are taken with the patient standing, supine, and in the Trendelenburg position.

Cases are presented which show the differential features between tumors, aortic or pulmonary aneurysms, and even aneurysms filled with thrombi. The vascular lesions maintain a constant type of pulsation, which varies with anatomic location, *i.e.*, aortic or pulmonic. The tracings of tumors transmitting pulsations vary with position, both of the patient and of the photocell, because pulsations from different cardiac chambers are being transmitted accordingly.

Seven illustrations, including 2 roentgenograms.

CHARLES NICE, M.D.
University of Minnesota

Angiocardiography in Thoracic Surgery. Israel Steinberg, Charles T. Dotter, and William DeW. Andrus. Surg., Gynec., & Obst. **90:** 45–59, January 1950.

The authors have found angiocardiography helpful in establishing the diagnosis and in revealing the exact position of intrathoracic lesions located near the heart or major vessels. Outlining the vascular channels helps determine the operability of a lesion and aids the surgeon in his choice of incisions and mode of approach to the lesion.

Besides identifying aneurysms and vascular anomalies, angiocardiography has helped delineate the vascular system from surrounding masses, such as dermoid cysts, pericardial cysts, bronchogenic cysts, thymic tumors, and tumors of the mediastinal nodes. The authors suggest that evidence of obstruction of the pulmonary circulation in bronchogenic carcinoma is an indication of inoperability, but feel that the possible benefit of operation should not be denied the patient on this evidence alone. Similar vascular obstruction may be seen in tuberculosis and atelectasis.

Angiocardiography has been used in over 1,000 cases without serious mishap, and the authors believe it can be employed almost routinely in cases in which thoracic surgery is contemplated.

Ten illustrative cases are reported, with 37 roentgenograms.

HUGH SMITH, JR., M.D.
University of Pennsylvania

Angiocardiography in Cyanotic Congenital Heart Disease. Maurice Campbell and T. H. Hills. Brit. Heart J. **12:** 65–95, January 1950.

Fifty cases of congenital heart disease (48 cyanotic and 2 acyanotic) in which angiocardiography was performed at Guy's Hospital (London) form the basis for this paper. Roll film 5 in. wide was employed for photographing the fluoroscopic image (16 × 16 in.), at the rate of one exposure per second. The anteroposterior position was used for the most part, because the chief interest lay in the aorta and its branches and the pulmonary artery. Because of two deaths, the authors recommend the liberal use of oxygen until full consciousness has been regained. The procedure was largely limited to patients thought to be candidates for surgery (Blalock-Taussig operation).

An over-riding aorta was usually demonstrated by rapid filling of the aortic arch and its branches at the time the pulmonary artery was or should have been opacified. The warning is given that "in any doubtful aorta, filling of the branches should always be looked for."

An attempt was made to estimate the degree of pulmonary stenosis by measuring the amount of flow through the lungs and the time of appearance of the dye in the pulmonary artery, but correlation was not good with blood flow measurements as calculated from cardiac catheterization.

Of the 50 cases, 31 were thought to be tetralogy of Fallot. In 25 of these angiocardiography showed moderate or severe pulmonary stenosis; in 6 it seemed slighter, and this led to some doubt about their suitability for the Blalock-Taussig operation, which, however, was as successful as in the others. An additional case resembling Fallot's tetralogy proved postmortem to be pulmonary atresia.

There were 5 cases with a picture of tetralogy of Fallot plus signs of ductus arteriosus. The diagnosis was supported by operation in one of these. In another, necropsy showed that there was, in fact, complete pulmonary atresia with a patent ductus, and some at least of the others were thought to have pulmonary atresia, or perhaps in one case a common arterial trunk, with the pulmonary blood supply through bronchial arteries.

In 2 cases the clinical diagnosis was tricuspid atresia with a non-functioning right ventricle, and this was supported by the angiocardiographic findings.

There were 7 cases clinically regarded as pulmonary valvular stenosis without a ventricular septal defect, but sometimes with a patent foramen ovale. In 3 of these there was no evidence of any shunt, and in one, without cyanosis, the absence of a septal defect was confirmed postmortem. In the other 4 there was thought to be a right-to-left shunt, and in 3 of these it was confirmed at autopsy.

In 2 instances the diagnosis was thought to be Eisenmenger's complex; in 1 cardiac catheterization afforded good evidence to support this diagnosis, but the angiocardiographic evidence was less decisive.

In the last 2 cases the clinical diagnosis was transposition of the aorta and pulmonary artery with septal defect; supporting evidence was furnished by catheterization and angiocardiography, though in one it was inconclusive and the transposition was probably partial.

The illustrations are numerous (50 roentgenograms) and well reproduced.

ZAC F. ENDRESS, M.D.
Pontiac, Mich.

Coarctation of the Aorta. J. Hillyer Smitham. J. Faculty Radiologists **1:** 198–221, January 1950.

A review of coarctation of the aorta is presented, with abundant reference to the work of others. Two types are described, the infantile and the adult. In the former, there is narrowing of the whole of the prestenotic part of the aorta, while in the latter the proximal aorta is normal in caliber or larger than usual. There are a number of theories as to the causation of coarctation. Maude Abbott's suggestion that it is due to a developmental error of the fourth and sixth branchial arches and that kinking of the abnormal part of the aorta is produced by fibrosis when the ductus arteriosus closes seems to bear the most weight.

The incidence of aortic coarctation appears to be about 1:80,000 of the population, with a preponderance

of males in a proportion of 3:1. Patent ductus arteriosus, bicuspid aortic valve, hypoplasia of the wall of the aorta, subaortic stenosis, and abnormal origin of the great vessels are the congenital cardiac abnormalities most commonly associated with coarctation. The commonest vascular abnormalities elsewhere in the body are probably small aneurysms of the circle of Willis.

Collateral circulation increases in extent as the patients grow older. If the ductus arteriosus is patent and enters the aorta below the coarctation, the collateral circulation is less obvious, as that part of the body below the coarctation is supplied from the pulmonary artery *via* the ductus.

Arteriosclerosis occurs early in these cases, especially in the zone of high blood pressure, and, if it is advanced, may be a contraindication to operation.

Radiologically there is usually some enlargement of the heart with rounding of the apex, indicating hypertrophy of the left ventricle. There is increased pulsation of the left border of the heart and of the origin of the great vessels. The ascending aorta is prominent to the right of the sternum, and there is what appears to be a high and apparently double aortic knuckle. The upper component of this knuckle is believed to be formed by the dilated subclavian artery and the lower by part of the aorta. This finding appears clearly in the postero-anterior view with barium in the esophagus, showing the apparent bulging of the esophagus to the left between the dilated left subclavian artery and the aorta, revealing the low position of the aortic knuckle. Kymography demonstrates discrepancy of pulsation between the components of the double knuckle. The actual site of the coarctation is usually shown only by angiocardiography. Rib notching is neither constant nor is it pathognomonic of coarctation; it has been observed also in hypertension due to other causes, in mitral and aortic lesions, in the tetralogy of Fallot, and in neurofibromatosis.

The various symptoms and clinical signs are well discussed. The common causes of death are cardiac failure of either acute or gradual onset, rupture of the heart or of the aorta proximal to the coarctation, cerebral accidents, and infective endocarditis. In the infantile type death usually occurs in the first decade; patients with symptoms appearing before the age of fifteen usually die before the age of thirty, while those who have no symptoms before the age of thirty have a much better prognosis.

Twenty illustrations, including 17 roentgenograms.

GLENN F. MILLER, M.D.
The Henry Ford Hospital

Coarctation of the Aorta. Surgical Treatment of 100 Cases. Robert E. Gross. Circulation 1: 41–55, January 1950.

Coarctation of the aorta is a diagnosis which can be made readily on the basis of the physical findings or a plain chest film. During the first eight or ten years of life there may be little variation from normal roentgenographically except for some left ventricular enlargement and diminution in size of the aortic knob. Beyond the teens the roentgen findings are more pronounced. The heart is apt to show mild or moderate increase in size, particularly of the left ventricle. The base of the ascending arch is likely to be widened, and the aortic knob or distal part of the arch lacks its normal prominence. Though it is by no means a constant finding, the shadow of the descending aorta may appear to be indented if the patient can be turned to an angle which will separate it from the spine. Compression of the esophagus, demonstrable with the aid of barium, and notching of the ribs are also common observations. Information regarding the exact position and extent of the stricture is obtainable by angiocardiography, though the author has sometimes found this procedure misleading.

Four types of operation are available. Sympathectomy and anastomosis of the left subclavian to the aorta below the constriction are not favored by the author as primary procedures. He believes that the best operation is excision of the narrowed segment and end-to-end anastomosis of the aorta. When the ends cannot be approximated after excision, the author introduces an aortic graft, using a segment taken from a cadaver. Six such grafts have been inserted with satisfactory results (three months to one and one-half years follow-up).

An operative series of 100 cases is reported. In 9 of these only exploration was done. There were 11 fatalities, 7 of which the author now regards as avoidable (changes in technic and refusing to operate in the face of certain complications). Thus he believes the mortality rate should be no more than 5 or 6 per cent. Of the remaining 80 patients, only 1 failed to get relief of hypertension (it was known that the constriction was not completely removed), 8 had fairly satisfactory relief, and in the other 71 there was complete disappearance of hypertension.

Six illustrations; 3 tables. ZAC F. ENDRESS, M.D.
Pontiac, Mich.

Pure Aortic Stenosis. G. A. Kiloh. Brit. Heart J. 12: 33–44, January 1950.

Twenty-seven cases of pure aortic stenosis found in patients under the age of fifty are analyzed with a view to popularizing the diagnosis and possibly discovering the etiology.

None of the author's patients gave a reliable history of rheumatic disease, and evidence from other sources is presented leading to the conclusion that the condition is not of rheumatic origin. The possibility that it is a congenital lesion is discussed.

A systolic murmur and thrill are present in the aortic area, but the thrill is sometimes detectable only in full expiration with the patient leaning forward. The aortic second sound, cardiac impulse, and blood pressure may be normal.

The most constant roentgen finding was prominence of the ascending aorta. Calcification of the aortic valve was detectable in about one-half of the author's cases, and slight or moderate increase in the size of the left ventricle was found in all but one.

Since many of the cases in his series were discovered by accident and were without symptoms, the author feels that this condition frequently remains undiscovered until late in life and is then called "calcific aortic stenosis," considered by most authorities as arteriosclerotic in origin.

Four illustrations, including 1 roentgenogram; 3 tables. ZAC F. ENDRESS, M.D.
Pontiac, Mich.

Atrophy of the Heart: A Correlative Study of Eighty-Five Proved Cases. H. K. Hellerstein and D. Santiago-Stevenson. Circulation 1: 93–126, January 1950.

Very little has been written on atrophy of the heart:

in fact, some authors have denied its existence. The present study is based upon 85 cases selected from 2,000 consecutive autopsies according to the following criteria: (1) decreased weight of the heart, (2) increased pigmentation of the heart muscle fibers, (3) serous atrophy of subepicardial fat, (4) wrinkling of the epicardium, (5) tortuosity of coronary arteries, (6) increase of nuclei/fiber ratio and (7) decrease of muscle fiber width. In each instance the atrophy was due to some chronic debilitating disease resulting in insufficient ingestion of food, complicated in some cases by prolonged fever, repeated surgery, and irradiation.

X-ray examination showed small or normal hearts with transverse diameters in the low normal range. Ungerleider's tables did not give accurate estimates in many cases, probably because many small hearts were dilated and thus showed a fairly normal silhouette. Also many patients had lost so much weight that they were below the range of the tables.

The physiological changes were similar to those found in experimental starvation, *i.e.*, decrease in cardiac output, blood volume, blood pressure, pulse pressure, cardiac reserve, vasomotor tone, and exercise tolerance, and electrocardiographic findings of low voltage and prolonged conduction time.

In view of their observations, the authors conclude that controlled starvation could probably arrest hypertrophy and provide rest for the heart when indicated.

Seventeen illustrations, including 4 roentgenograms; 18 tables.

ZAC F. ENDRESS, M.D.
Pontiac, Mich.

Visualization of the Coronary Circulation During Angiocardiography. Alvin J. Gordon, Sigmund A. Brahms, and Marcy L. Sussman. Am. Heart J. **39:** 114–124, January 1950.

In 10 of approximately 1,200 angiocardiographic examinations the authors were able to identify one or more of the coronary arteries. They were seen most often in children, due in part to the better contrast in films of young subjects. Almost always it was the right coronary which was identified. This is readily understood, since the right ventricle is usually empty of contrast material when the aorta and branches are opacified. At the same time the left ventricle obscures the left coronary artery. The left coronary was seen rather clearly in one case of tetralogy of Fallot, where the aorta received the contrast medium directly from the right ventricle before any of it reached the left ventricle.

When it is filled with diodrast, the right main coronary artery is not difficult to identify. It is a narrow vessel arising from the upper part of a bulge at the origin of the aorta representing the sinus of Valsalva. It courses downward and to the right, curving backward and reversing its direction as its caliber decreases. Small branches of the vessel can often be seen in the films. The identity of the left anterior descending artery is less easily established. In general the criteria are similar: visualization of a vessel arising from the region of the sinus of Valsalva simultaneously with the aorta, of the proper size and proper direction.

In 2 cases, in adults, the coronary sinus was opacified by retrograde filling from the right auricle.

Exposures were made at a maximum rate of 2 per second, usually for one-sixtieth of a second.

Seven roentgenograms; 1 drawing; 1 table.

ZAC F. ENDRESS, M.D.
Pontiac, Mich.

Roentgen Visualization of Coronary Calcifications. Friedrich Gauwerky. Fortschr. a. d. Geb. d. Röntgenstrahlen **71:** 743–753, September 1949. (In German)

The author contributes two cases of roentgenologically demonstrable coronary calcification. In one of these both coronary arteries were involved; in the other, only the left one. The roentgenograms were obtained from the fluoroscopic screen.

Diagrammatic sketches are reproduced to show the location of the right and left coronary arteries in the different projections. The localization of the coronary arteries is also explained and illustrated by comparable roentgenograms of contrast-filled arteries in cadavers.

The roentgen diagnosis of incipient coronary disease may play an important role in the future, especially in cases without clinical symptoms and with negative electrocardiograms.

Seven roentgenograms; 5 drawings.

EUGENE F. LUTTERBECK, M.D.
Chicago, Ill.

Roentgenographic Detection of Coronary Arteriosclerosis. J. Edwin Habbe and Hobart H. Wright. Am. J. Roentgenol. **63:** 50–62, January 1950.

The importance of demonstrating calcification in the coronary arteries is pointed out. This finding can be correlated with the clinical impression and may serve as additional evidence for the diagnosis of coronary artery disease.

The authors describe their technic of multiple high-speed aimed spot roentgenography. They believe that this will reveal nearly twice as many cases of coronary arteriosclerosis as roentgenoscopy alone. After careful roentgenoscopy, including orthodiagraphy, in search for intracardiac calcification, they examine their patients on a serialograph. The patient lies prone, and at least four views are obtained. A 10 × 12-inch cassette and a small 3-inch cone are used, the cone being placed close to the skin of the patient's back. The approximate location of the left coronary artery is penciled on the skin, and the cone applied over this area. Exposures are made at 1/30 of a second with 360 ma. and 60 to 70 kv.p. The first exposure is made with the patient exactly prone; for the second he is turned about 5 to 10 degrees into the right oblique; and for the third 5 to 10 degrees into the left oblique. The fourth view is obtained with the patient shifted 1 or 2 inches to the left and turned 20 to 30 degrees into left oblique.

In a period of approximately two and one-half years, during which every cardiac patient over the age of forty received the benefit of multiple aimed spot roentgenograms and kymograms, an incidence of approximately 3 per cent of coronary arteriosclerosis was demonstrated.

The anatomy, pathology and etiology of coronary artery disease are discussed.

Eight roentgenograms.

ROBERT A. HAYS, M.D.
Cleveland Clinic Foundation

The Problem of Excessive Radiation During Routine Investigations of the Heart. T. H. Hills and R. W. Stanford. Brit. Heart J. **12:** 45–53, January 1950.

The authors present a rather thorough investigation of the problem of excessive irradiation incident to examination of the heart, including cardiac catheterization, angiocardiography, and routine filming and fluoroscopy, all of which may well be (and have been)

done on a single patient. The doses received by the surgeon, anesthetist, and radiologist are also considered.

Observations were made on patients and on a wax phantom representing the patient. Routine methods of angiocardiography and catheterization were used and the instruments employed for determining dosage included a Victoreen dosemeter, a pocket-type Lauritsen dosemeter, and a small condenser ionization chamber with a Baldwin Farmer electrometer. The various procedures are considered separately and in combination.

In a complete investigation of the heart, including ordinary chest films taken at 6 ft., fluoroscopy (and probably filming) with a barium swallow, fluoroscopy and filming during catheterization, and angiocardiography, the patient receives a skin dose of approximately 136 r, as follows:

Chest film	0.04–0.22 r
Fluoroscopy and filming with barium	
Fluoroscopy	7.7 r for average screening time of 3 1/2 min.
Filming	0.6–1.9 r per film
Catheterization	
Fluoroscopy	110 r for screening time of 20 min.
Filming	1 r per film
Angiocardiography (series of 10 films)	15 r

For ten films in angiocardiography the anesthetist receives 8 to 15 r to his hands, the exact dose depending on their position, and 0.27 r as total-body irradiation. The surgeon and radiologist also receive more than the permissible daily dose, though in the experimental setup no protection was used. These figures are for a single examination. If more than one is carried out in a week, the doses are increased proportionately.

Protective measures include: (1) increasing the distance from the source of radiation when possible; (2) use of protective clothing; (3) lead, lead glass, or lead rubber screening. The filament current and kilovoltage in fluoroscopy should be kept at a minimum. [The authors do not mention using at least 1.0 mm. aluminum filter on the fluoroscopic tube.] A patient who has received a dose in the neighborhood of 150 r should not have any further irradiation to the same area for at least fourteen days, and in any year should not receive such a dose on more than three or four occasions.

Seven tables; 2 diagrams.

ZAC F. ENDRESS, M.D.
Pontiac, Mich.

THE DIGESTIVE SYSTEM

Benign Tumors of the Esophagus. Report of a Case of Leiomyoma. Paul S. H. Chi and W. E. Adams. Arch. Surg. **60:** 92–101, January 1950.

The authors report the case of a healthy 25-year-old student who was found, on a photoroentgen study, to have a right mediastinal mass. Further roentgen examination showed signs suggestive of an intramural tumor of the esophagus. Resection, with transplantation of the stomach, was successful, and the patient recovered and continues to be asymptomatic. The microscopic diagnosis was leiomyoma.

A brief review of the literature showed that among 20 reported cases of benign esophageal tumor treated surgically through the chest and abdomen, there were 11 recoveries; 4 patients died, and in 5 the outcome was unknown.

Seven illustrations, including 2 roentgenograms; 2 tables.

LEWIS G. JACOBS, M.D.
Oakland, Calif.

Study of the Normal and Abnormal Stomach After the Ingestion of a Very Hot Barium Meal. Lino Dalla Bernardina. Ann. radiol. diag. **22:** 37–57, 1950. (In Italian)

The author has been using a barium meal at a temperature as high as the patient will stand and has observed several modifications of the gastric physiology. After the ingestion of a very hot meal, the tone of the stomach is decreased, peristalsis is shallow or absent, and the mucosal folds are flattened, probably because of the relaxation of the muscularis mucosae. The author states that the changes occurring after ingestion of a very hot meal can be utilized in differentiating organic from spastic conditions.

Twenty roentgenograms.

CESARE GIANTURCO, M.D.
Urbana, Ill.

Attempts at Gastric Examination by Photofluorographic Methods. Rolf Bull Engelstad and Selmer Rennaes. Acta radiol. **33:** 49–56, January 1950.

This is a preliminary report describing the technic employed for photofluorography in examination of the stomach. The equipment consisted of a conventional chest photofluorographic unit with Schmidt optical system, using 70-mm. perforated film.

The patients were examined in the erect position and three exposures were made, one in the anteroposterior position and two in oblique positions. Photofluorographic films were also obtained with the patient recumbent. For the erect examination the exposure time was 0.8 to 2.0 seconds, at 85 kv. and 30 ma. For the recumbent examination the kilovoltage varied from 75 to 80 kv., at 200 ma., and the exposure time from 0.15 to 0.3 seconds. The authors have not as yet been able to determine which position is most satisfactory for mass examination. The prone position gives the best means of adequate compression and the most satisfactory visualization of the cardia; however, examination in the erect position is the most convenient.

Films were made four to five minutes after the ingestion of a glass of barium mixture, at which time the medium is uniformly distributed. Up to 30 patients were examined per hour at a film cost of about 15 cents per examination.

In a series of 150 individuals above the age of forty without symptoms referable to the gastro-intestinal tract no cases of gastric carcinoma or of active peptic ulcer were detected. Eight patients with gastric carcinoma diagnosed by conventional roentgenographic methods were also examined by the photofluorographic method and their lesions were clearly visualized.

The authors intend to pursue this method of examination further and extend it to include several thousand individuals above the age of forty. They do not maintain that the method will be thoroughly reliable for detection of all early gastric lesions but hope that they may be able to uncover sufficient silent or at least unde-

tected and operable cases of gastric cancer that its use will be justified.

Eight roentgenograms; 1 photograph.

JACK WIDRICH, M.D.
Cleveland City Hospital

Roentgen Studies of the Upper Gastro-Intestinal Tract in Vagotomy. Frank Isaac, Richard E. Ottoman, and Joseph A. Weinberg. Am. J. Roentgenol. **63:** 66–75, January 1950.

Eighty-three patients undergoing vagotomy were examined both preoperatively and postoperatively following a barium meal. Postoperative examinations were made one week, one month, three months, and six months after surgery. They included roentgenoscopy and films made at two, four, and six hours. The changes noted postoperatively were (1) loss of tone with dilatation of the stomach, (2) decreased motility, (3) decreased peristalsis. In the initial post-vagotomy period, 57 per cent of the patients exhibited atony, and after six months 20 per cent still showed this change. Delayed motility was observed initially in 80 per cent of the patients; after six months 41 per cent still had six-hour retention. The most common of the post-vagotomy changes was a decrease of peristaltic action. It was present in 87 per cent of the cases in the early postoperative period, in 83 per cent at one month, and in 48 per cent at six months.

Patients having gastro-enterostomy in addition to vagotomy showed in general an earlier return to normal than those with vagotomy alone. It was also observed that few patients in whom a definite ulcer was demonstrable in the duodenal bulb prior to operation were found to have an active ulcer following vagotomy.

There were definite alterations in the pattern and motility of the small intestine as a result of vagus section. The most significant change was moderate dilatation of the second and third portions of the duodenum. These changes are particularly prominent immediately postoperatively and tend to disappear. Alterations in pattern included pooling of the meal and segmentation and flocculation of the barium, somewhat suggestive of the pattern found in deficiency states.

Eight roentgenograms.

ROBERT A. HAYS, M.D.
Cleveland Clinic Foundation

Gastric Diverticula. Jack Greenfield, Nathaniel E. Rossett, and Walter H. Mendel. Arch. Surg. **60:** 65–74, January 1950.

Four gastric diverticula were seen at the Kennedy Hospital (Memphis, Tenn.) from November 1946 to January 1948. All were found on routine roentgenography of the gastro-intestinal tract. Medical management was followed by complete relief in 1 and partial relief in another; in the other 2, surgical excision was done through a thoracoabdominal approach.

The x-ray diagnosis of gastric diverticula requires careful observation; it is a common experience that the first bolus of contrast medium shows the diverticulum, which then empties and is refilled only with difficulty. The outpouching raises the question, in addition to diverticulum, of the possibility of ulcer, ulcerated neoplasm, and normal contour variation. Differential points are the common occurrence of diverticulum on the posterior wall of the stomach, a location rare for ulcer; and the flask-like contour of a diverticulum, with a narrow neck, in contrast to ulcer. While contour irregularity and infiltration of the wall are usually absent, inflammatory changes may occasionally produce these signs.

A brief discussion of the technical advantages of the thoracoabdominal approach for the excision of diverticula is included.

Five illustrations, including 2 roentgenograms.

LEWIS G. JACOBS, M.D.
Oakland, Calif.

Alterations of the Pyloric End of the Stomach Associated with Ulcers of the Lesser Curvature. Antonio Gavazzeni. Radiol. med. (Milan) **36:** 16–21, January 1950. (In Italian)

The author describes five cases in which the pyloric antrum was markedly narrowed, either because of spasm or because of hypertrophic rugae. In all these cases, he was able to demonstrate the coexistence of an ulcer crater along the lesser curvature.

This article is of particular interest inasmuch as the etiology of the so-called antral hypertrophic gastritis has remained until now somewhat of a mystery. The author suggests that a careful search should be made for ulcerations along the lesser curvature whenever the pyloric end is narrow or shows hypertrophic folds.

Eight roentgenograms.

CESARE GIANTURCO, M.D.
Urbana, Ill.

Etiology and Pathogenesis of Prolapsed Gastric Mucosa into the Duodenum. Abraham Melamed. Am. J. Digest. Dis. **17:** 4–10, January 1950.

Prolapse of gastric mucosa into the duodenum is rapidly gaining recognition as a cause of upper gastro-intestinal discomfort. In the experience of the author its incidence is higher than that of benign gastric ulcer. There are two types: (1) partial prolapse of one or two mucosal folds; (2) prolapse involving the entire circumference of the stomach, resulting in a cuff-like deformity on the roentgenogram.

The cause of gastric mucosal prolapse is not well established. It is known that the mucosa is capable of movement independent of contractions of the muscularis, and it has been suggested that failure of the normal stretching mechanism of the mucous membrane during peristalsis of the antrum may result in prolapse into the duodenum. Another theory is that inflammation may cause hypertrophy of a segment of mucosa, which in turn is pushed through the pyloric ring during peristalsis.

The author has made a positive diagnosis of this condition in 50 cases, in 3 of which surgical verification was obtained. The microscopic changes in each case were described as those of chronic granular gastritis.

Four of the author's cases were secondary to congestive heart failure. It is believed that the submucous and mucosal edema associated with that condition can result in slipping of the mucosa, which can reverse itself with improvement of the circulation.

Twenty-three roentgenograms; 3 photomicrographs.

JOSEPH T. DANZER, M.D.
Oil City, Penna.

Prolapse of Redundant Gastric Mucosa into the Duodenum. Rolf Köhler. Acta radiol. **33:** 69–82, January 1950.

Four cases of prolapse of redundant gastric mucosa into the duodenum are presented, one of which was

verified by operation. Roentgenograms of these patients are presented showing the typical, irregular, arch-like defects at the base of the duodenal bulb.

The various theories as to the etiology of this condition are reviewed. The author favors the neurogenic theory and believes that a diseased state of the stomach is not a necessary prerequisite to prolapse. The clinical symptoms and x-ray findings are discussed. Roentgen visualization is facilitated by, and may be dependent upon, compression. Films made with the patient erect are best for the study of peristalsis, which is usually increased, and for determining the degree of compression required.

The author states that surgical intervention should be resorted to only in cases of profuse hemorrhage or recurrent symptomatic relapses.

Seventeen roentgenograms; 2 photographs.

DONALD F. MAURITSON, M.D.
Cleveland City Hospital

Gastrojejunocolic Fistula Following Gastrectomy. Francisco Yazlle and Edmundo Saigg. Prensa méd. argent. **37:** 132–139, Jan. 20, 1950. (In Spanish)

Gastrojejunocolic fistula is practically always the result of gastric ulcer. The most frequent cause is postoperative gastrojejunal peptic ulcer. Other causes which may operate are cancer of the stomach or colon, abscess of the abdominal cavity, visceral tuberculosis, ulcerative colitis and syphilis, certain traumas, and congenital deformities of the gastro-intestinal tube. The treatment consists of the elimination of these causes.

A number of case reports are given in detail, having to do especially with the surgical technic.

Sixteen illustrations, including 6 roentgenograms.

JAMES T. CASE, M.D.
Chicago, Ill.

Extrinsic Duodenal Obstruction in the Newborn. Allan E. Sachs. Ann. Surg. **131:** 117–123, January 1950.

Most cases of stenosis and atresia of the duodenum in the infant are due to incomplete formation of the lumen. Extrinsic causes include compression by adhesions from the cecum in malrotation of the large intestine and adhesive bands of other etiology.

Three cases are reported. In 2 patients malrotation of the large bowel was found to be associated with adhesions between the cecum and the duodenum, blocking the latter. In one of the patients the appendix was coiled around the duodenum. The bile-stained vomitus suggested obstruction of the distal duodenum rather than pyloric stenosis. In the third patient an adhesive band containing an anomalous artery caused obstruction of both the duodenum and the common bile duct.

The author assumes that the adhesions secondary to malrotation of the large bowel caused duodenal obstruction. However, in view of the presence of adhesions between the duodenum and cecum in both cases, it is possible that the malrotation was due to the adhesions rather than *vice versa*.

Six illustrations, including 4 roentgenograms.

MORTIMER R. CAMIEL, M.D.
Brooklyn, N. Y.

Hirschsprung's Disease in Infancy. E. D. Burnard. Brit. M. J. **1:** 151–156, Jan. 21, 1950.

The author describes the symptoms and prognosis of Hirschsprung's disease in the neonatal period and early infancy and discusses to some extent the management of the neonatal group. He reports 5 cases in detail. In all, 7 cases were followed from a few days after birth to eight months, and the records of 23 other cases were available for study.

The usual clinical features were: (1) vomiting as the first symptom, (2) delay in passage of meconium and distention, (3) progressive intermittent constipation. There was no evidence of familial incidence and no genito-urinary disturbance in the cases observed.

The diagnosis was proved radiologically in all cases, the examinations being either by barium enema or barium meal. The length of the affected bowel and the severity of the consequent disease varied greatly.

Seven illustrations, including 5 roentgenograms.

J. B. SCRUGGS, M.D.
University of Arkansas

Acute Volvulus of the Cecum—A Method of Diagnosis, with Report of a Case. Harold H. Lindner and Sanford Marcus. California Med. **72:** 58–60, January 1950.

Volvulus of the cecum and ascending colon can in many instances be diagnosed before operation. The two most important diagnostic aids are (1) the taking of a proper history and (2) a proper interpretation of x-ray films of the abdomen. A history of previous attacks of sharp, cramp-like abdominal pain and distention linked to preceding bouts of constipation, diarrhea, violent exercise, or sudden change of position, should suggest chronic or subacute ileocolic volvulus, with self-relief of the twist.

Early plain films of the abdomen are important. In all cases, intestinal volvulus becomes a closed-loop obstruction and rapid distention of the strangulated loop and of the abdomen then takes place. If the enlarged loop does not respond to the deflating measures of intubation with a Harris tube or enemata and rectal tubes, suspicion of closed-loop obstruction should be aroused. In a case reported by the authors, the x-ray films taken at ten-hour intervals, showed this quite well. It was noted in the films that the dilated closed loop of obstructed bowel occupied the mid- and left lower abdomen, lying convexly to the left. Because in by far the greater percentage of cases of volvulus of the cecum the rotation is in a clockwise direction to the left, around the apex of the lowest portion of the fixed ascending colon, it is easy to see the reason for this. Volvulus of the sigmoid colon presents no such picture. The large dilated closed loop in this syndrome rises from the pelvis from a triangular terminal area and balloons into a loop which may occupy any portion of the lower abdomen, right or left. Volvulus of the terminal portion of the ileum, which accounts for about 47 per cent of all cases of intestinal volvulus as against 42 per cent for volvulus of the cecum and 11 per cent for volvulus of the sigmoid colon, may cause some diagnostic difficulty. The colon will show haustral markings and larger fluid levels at an early stage of obstruction.

Four roentgenograms.

DANIEL WILNER, M.D.
Atlantic City, N. J.

The Liver Edge and Its Roentgenologic Examination. F. Reimann and R. Weil. Radiol. clin. **19:** 23–36, January 1950. (In German)

Investigation of the abdominal organs, especially the

liver, is clinically dependent, for the most part, on palpation to determine size, irregularity, consistency, nature of lower border, etc. Additional information, especially in the early stages of disease processes, may be furnished by plain x-ray films. The author does not feel that pneumoperitoneum is necessary routinely. The study of the liver is combined with the usual investigation of the gallbladder and ducts.

Two groups of patients were studied: those with clinical and palpable evidence of disease involving the liver and those showing no evident disease. Both groups were classified according to the contour of the liver edge: (1) sharp or pointed; (2) blunted or rounded.

In normal cases the liver edge lies between the eleventh and twelfth ribs and parallel to the latter. The normal angle of the lower outer border of the liver lies between 30 and 50 degrees. Occasionally, however, a normal case shows a more sharply pointed angle. This, therefore, was not considered abnormal in the absence of clinical evidence of disease and where no pathological changes were found in the other organs.

An angle of over 55 degrees was considered evidence of some form of pathological change, especially if there was assocated blunting or rounding of the liver edge. Increase in the volume of the liver associated with blunting or rounding, or the appearance which the authors describe as a "leaf pattern," namely general blunting but with the extreme angle forming more or less of a point, strongly suggests inflammatory swelling, hypertrophic cirrhosis, acute biliary stasis, or congestion secondary to cardiac decompensation. Associated changes in the gallbladder and other organs often lend confirmatory evidence to these findings.

Decrease in the size of the liver suggests an atrophic condition or possibly a normally small liver. Decrease in size with a blunt angle indicates atrophic cirrhosis.

Enlargement generally, with a sharp edge, especially if the lower border is irregular or lobulated, indicates abscess, gumma, echinococcus, or tumor.

Two tables summarizing clinical and x-ray findings; 2 roentgenograms; 1 line drawing.

[In routine work we are prone to overlook obvious changes in the liver, especially in cases of poorly or totally non-functioning gallbladder. This article calls our attention to an observation which will lend confirmatory evidence in many such cases.—E. S.]

EDGAR SPACKMAN, M.D.
Fort Worth, Texas

Advantages of the Right Lateral Decubitus in Cholecystography. B. R. Kirklin. Texas State J. Med. **46:** 5–8, January 1950.

Of all impediments to satisfactory roentgenography, obscuration of the gallbladder by other organs or their contents, particularly gas in the bowel, has been perhaps the most difficult to overcome. In this way the minute and delicate shadows or translucencies representing a few small gallstones or tumors are readily obliterated.

The author advocates roentgenography in the right lateral decubitus as a feasible solution of this problem. Apparatus was improvised with a plain table, a vertical Potter-Bucky diaphragm, a cassette changer, and a vertical tube stand. The following procedure was then developed: The patient is posed in a true right lateral position with his abdomen against the cassette and is immobilized with a canvas band; the rays are directed horizontally through the gallbladder region. After the first 8 by 10-inch cassette-encased film is exposed, a second cholecystogram is made 2 inches caudad from the first.

The results have exceeded expectations. In almost every instance the gallbladder falls toward the patient's right side, below the obscuring gas-filled loop, and small gallstones and tumors not shown with the patient in other positions become discernible. Pitressin is not required in more than 0.5 per cent of examinations.

It is not to be inferred that this position should supersede the standard prone position commonly employed, for the latter is effective in revealing adenomas and other tumors of the gallbladder and should be used both before and after administration of the fatty meal. The right lateral decubitus should be applied as a supplementary routine whenever the roentgenogram with the patient in the prone position reveals (1) what appears to be a normally functioning gallbladder without gallstones, (2) doubtful shadows or shadow-defects that might represent gallstones, or (3) obscuration of the gallbladder region by intestinal gas. In any of these situations the lateral postion can confidently be counted on to supply decisive information.

Eight roentgenograms; 1 photograph.

DANIEL WILNER, M.D.
Atlantic City, N. J.

Concerning a Biliary Calculus Arrested in the Duodenal Bulb. M. Demole, M. Massih, and B. Thommen. J. de radiol. et d'électrol. **31:** 16–20, 1950. (In French)

Passage of a biliary calculus from the gallbladder through the common duct and into the intestinal tract is not common. On the other hand, fistulous communication between the gallbladder and intestine is not rare, being actually found in 3 per cent of autopsied bodies.

When the calculus reaches the duodenum, effort is made to expel it either by vomiting or by the rectal route. It may be arrested in some portion of the intestine, set up an inflammatory reaction, and cause complete or incomplete, sudden or intermittent, obstruction.

Some interesting historical notes are given. A case is cited of a 52-year-old male who had ill-defined symptoms at the age of 35, and was placed on a low-fat diet after the age of 42. The patient was admitted with jaundice, right upper quadrant tenderness, biliary pigments present in the stool, bile salts in the urine, and a leukocytosis of 13,000. The gallbladder could not be visualized by cholecystography. Barium-meal examination revealed a constant lacunar filling defect in the duodenal bulb. At operation two gallstones were found in the gallbladder, one in the duodenal bulb, and one in the stomach, with a fistulous communication between the gallbladder and the duodenal bulb.

To be differentiated from this condition are benign and malignant duodenal tumors, phyto- and trichobezoars, and aberrant pancreas. A smooth polycyclic contour suggests a benign tumor. Malignant tumors usually cause more deformity and irregularity. Bezoars are not homogeneous in appearance but rather reticulated, and the trichobezoar has a tapering prolonged extremity. Aberrant pancreas is seen in about 1.5 per cent of autopsies, and in one-third of these it is in the duodenum or ileum. It may give rise to a pseudo-diverticular or lacunar image.

Twelve roentgenograms; 1 drawing.

CHARLES NICE, M.D.
University of Minnesota

Angina Pectoris Simulated by Chronic Peripancreatitis and Pancreatitis. M. W. Mettenleiter and Franz J. Lust. Am. J. Digest. Dis. **17:** 11–13, January 1950.

Pain in the sternum radiating to the left arm, on exertion, suggests a diagnosis of angina pectoris. This was the complaint of the authors' patient, a man of 48 years. It had been attributed first to gas and then to angina pectoris, and treatment had been given accordingly, but without effect. When the patient was seen by the authors the pain was so severe on the slightest exertion that he was unable to work. Heart sounds, blood pressure, and the electrocardiogram were normal. The only untoward sign was vague tenderness in the epigastrium on pressure. Because of this, cholecystography was done, but the gallbladder appeared normal. A barium-enema study was then made, showing a loop of the hepatic flexure fixed somewhat higher and more to the midline than normal. Examination of the upper gastro-intestinal tract showed the typical widened duodenal loop caused by a mass involving the head of the pancreas.

On operation a solid band of adhesions was found holding the omentum to the transverse colon and pulling the stomach and gallbladder toward the hepatic flexure. When these were freed, a thickened pancreas and a thickened capsule were revealed, and a diagnosis of peripancreatitis and pancreatitis was made. The patient made an uneventful recovery and the angina-like pains disappeared.

Two roentgenograms. JOSEPH T. DANZER, M.D.
Oil City, Penna.

Fibrosis of the Pancreas. Enterogastrone and the "Duodenal Mechanism" in Relation to Increased Appetite. Charles Upton Lowe, Charles D. May, Herbert M. Stauffer, and Edward B. D. Neuhauser. Am. J. Dis. Child. **79:** 91–98, January 1950.

Gershon-Cohen and his associates have demonstrated what they term the "duodenal mechanism" (see Radiology **48:** 232, 1947). When fat fed to normal patients reached the duodenum, the pylorus closed and remained closed for long periods. When fat was placed directly in the duodenum, the mechanism operated immediately. Other workers have shown that an extract of duodenal mucosa which had previously been in contact with fat is able to inhibit gastric activity when administered intravenously. The agent responsible for the inhibition is called enterogastrone.

The present writers conducted a study of children with fibrosis of the pancreas to determine whether or not the pancreas is involved in the production of an enterogastrone-like substance which might play a role in the so-called duodenal mechanism, as well as to discover an acceptable physiologic explanation for the ravenous appetite characteristic of this condition and its abatement with the administration of dried pancreas. They administered to a selected group of patients successive doses of barium sulfate alone, a barium sulfate-fat mixture, and pancreatin followed by barium sulfate and fat. Two normal controls received barium sulfate and barium sulfate plus fat.

The observations confirm the experimental findings of others, that the normal relationship between gastric motility and emptying time and a fatty meal is not present in patients with fibrosis of the pancreas. In normal subjects the addition of fat to the barium meal resulted in delayed emptying. In patients with fibrosis of the pancreas the feeding of fat did not have this effect, but when pancreatin was administered thirty minutes before the fatty meal the progression was similar to that in normal children. These observations suggest that the humoral agent responsible for the "duodenal mechanism" depends on either a normal pancreas *in situ* or the products of normal pancreatic digestion.

It was also observed that in normal patients the small bowel showed the so-called deficiency pattern following a fatty meal. This was not true of patients with fibrosis of the pancreas except after the administration of pancreatin, in which case the deficiency pattern was observed just as in normal subjects. It might be concluded from these observations that segmentation, fragmentation, and clumping in the small bowel appear whenever it contains an excess amount of fat, but this fails to explain the absence of this pattern after a fatty meal in patients with fibrosis of the pancreas. It appears rather that this intestinal picture may be due to the same hormone which is responsible for the duodenal mechanism, and is dependent upon an intact pancreas.

Ten roentgenograms.

MORTIMER R. CAMIEL, M.D
Brooklyn, N. Y.

THE PERITONEUM AND RETROPERITONEUM

Pneumoperitoneum of Unknown Origin. Franco Fugazzola. Radiol. med. (Milan) **36:** 41–82, January 1950. (In Italian)

The finding of free gas in the peritoneal cavity should always call for a surgical exploration of the abdomen in a search for intestinal perforations. The author reports 3 cases and collects 36 others from the literature in which no intestinal perforation could be demonstrated.

In many of these cases, the surgeon was probably not able to find a small perforation. In some the free air in the peritoneum could be attributed to vaginal douches or to antiperistaltic action of the tubes, or to ruptured small cysts in pneumatosis cystica of the colon.

Three roentgenograms; 1 drawing; 1 table, summarizing the reported cases. CESARE GIANTURCO, M.D.
Urbana, Ill.

Pneumoretroperitoneum. Ribeiro do Rosário, Damião Pires, Taborda Duarte, and Idálio de Oliveira. Gaz. méd. Portuguesa **3:** 14–20, 1950. (In Portuguese)

The authors, after a review of the methods now used for the visualization of the retroperitoneal space by the injection of gas, describe their experience with a new technic for "pneumoretroperitoneum," originated by Ruiz Rivas, of Portugal. They point out the advantages of the method and reproduce some of the roentgenograms obtained with it.

Thirteen roentgenograms.

THE MUSCULOSKELETAL SYSTEM

Engelmann's Disease. Osteopathia Hyperostotica (Sclerotisans) Multiplex Infantilis; Progressive Diaphysial Dysplasia. A. C. Bingold. Brit. J. Surg. **37:** 266–274, January 1950.

Engelmann's disease is a rare, ill-defined process, characterized by progressive hyperostosis and fusiform expansion of the cortex of the long bones, with associated malnutrition and underdevelopment. Sclerosis

of the base of the skull, the first cervical vertebra, and portions of the pelvis has also been observed.

The author presents in summary the 7 previously recorded cases and adds an eighth, in a boy of fourteen. The ages of the 8 patients varied from four to twenty-four years. Among the more common symptoms were vague pains in the lower limbs, a peculiar gait, easy fatigability, poor appetite, and failure to gain weight. Minor abnormalities of the nervous and endocrine systems were noted.

The final diagnosis depends upon the typical fusiform sclerosis of the shafts of the long bones as seen radiographically. Pathological studies reveal that the radiologically dense areas of the affected bones represent cortical hyperostosis. Apart from its massiveness, the bone is of normal lamellar structure.

The condition should be differentiated from osteopetrosis, infantile cortical hyperostosis, and metaphyseal dysplasia. The pathology and boundaries of the unusual osseous diseases are, however, still so inexactly defined that differential diagnosis may be difficult.

Eleven illustrations, including 5 roentgenograms.

MORTIMER R. CAMIEL, M.D.
Brooklyn, N. Y.

Infantile Cortical Hyperostosis. Vincent DePaul Larkin and Paul Rousseau. Am. J. Dis. Child. **79:** 105–110, January 1950.

Two probable cases of infantile cortical hyperostosis are presented. In the first infant there was a pustular eruption of the neck, with a swelling of the jaw on the right. A roentgenogram revealed a soft-tissue mass over the angle of the right mandible, and biopsy showed chronic inflammation. The swelling showed some response to treatment with penicillin but recurred when the drug was discontinued. Roentgenograms of the jaw now revealed widening of the mandible and periosteal "lift and productive changes." The radiologist suggested osteomyelitis as the cause. No other bones were affected.

If this is indeed a case of infantile cortical hyperostosis, a clue to its cause is given by the associated skin infection and good response to prolonged penicillin therapy.

The second infant had a generalized edema, most marked over the lower extremities. Roentgenograms revealed considerable periosteal proliferation of the shafts of the long bones of the lower extremities. The other bones appeared normal. Hypervitaminosis A, which may simulate infantile cortical hyperostosis, was excluded by a vitamin A absorption test.

One roentgenogram; 1 photograph.

MORTIMER R. CAMIEL, M.D.
Brooklyn, N. Y.

Diffuse Scleroderma. David R. Sacks, Thomas W. Inmon, and James R. O'Neill. Texas State J. Med. **46:** 37–42, January 1950.

The authors present two cases of scleroderma illustrating the clinical forms of this rather rare disease of connective tissue.

In the first case, roentgenograms showed moderate periarticular demineralization of the long bones in both hands. There were a definite decrease in the proximal and distal interphalangeal joint spaces of all fingers and a very slight decrease in the joint space of the metacarpal phalangeal articulation. These changes were similar to those seen in the rheumatoid type of arthritis or chronic peripheral vascular disease. There were two small, irregular calcium deposits in the ventral aspect of the distal end of the left thumb and a minute calcium deposit in the soft tissues of the distal phalanx of the right thumb. A gastro-intestinal series showed moderate spasm involving the lower inch and a half of the esophagus. The stomach appeared normal except for pylorospasm.

In the second case, roentgenograms of the hands were essentially negative, but the feet showed marginal, punched-out defects at the head of the first metatarsal phalanx and the base of the proximal phalanx of the great toe bilaterally. Metatarsal phalangeal joints were somewhat narrowed, and there were moderate valgus deformities of the toes. A gastro-intestinal series revealed the esophagus to be fairly wide, the barium passing with difficulty. The distal segment did not expand completely. The stomach showed low and slow peristaltic waves with the lower portion of the pars media somewhat narrowed.

Seven roentgenograms; 3 photographs.

DANIEL WILNER, M.D.
Atlantic City, N. J.

Unpublished Clinical and Radiomorphological Findings in the Syndrome of Rocher-Sheldon. G. Voluter and D. Klein. J. de radiol. et d'électrol. **31:** 9–12, 1950. (In French)

The syndrome of Rocher-Sheldon, involving both ectodermal and mesenchymatous structures, is little known. The condition is probably caused by chromosomal aberration.

A case is presented of a girl ten years of age, who showed the following malformations: localized absence of pigment of the skin and hair, with slate-blue irises; deafness of labyrinthine origin; amyoplasia and congenital articular rigidity or stiffness; osseous dysplasia of skull, thorax, shoulders, elbows, wrists, sacrum, and feet; ankyloblepharon of the medial portion of the eyelids. There was no familial history suggestive of the disease.

Amyoplasia and articular stiffness are seen in most cases, but the other findings noted here are unusual.

Nine roentgenograms. CHARLES NICE, M.D.
University of Minnesota

Albers-Schönberg Marble-Bone Disease with Peculiar Changes of the Sternum in Father and Son. Ernst Theilkäs. Radiol. clin. **19:** 1–6, January 1950. (In German)

An unusual finding in a 21-year-old male suffering from Albers-Schönberg disease was the occurrence of five distinct translucent areas, one above the other, involving the body of the sternum and the xiphoid process. The areas were composed of fine spongy bone surrounded by sclerotic rings and were sharply demarcated. Other parts of the skeleton showed a generalized osteosclerosis. The vertebral bodies, pelvis, long bones, and clavicles were affected. No changes were observed in the skull or feet. The spine, especially the bodies of the dorsal and lumbar regions, showed peculiar broad bands of increased density at the upper and lower borders. There was an associated anomaly of both fifth fingers, consisting of shortening of the middle phalanx and clinodactyly.

On inquiring into the family history it was found that the father of the patient showed identical changes, ex-

cept for the variations involving the fingers. X-ray studies demonstrated similar "punched-out areas" in the sternum and also the band-like zones of dense bone in the vertebral bodies. This was considered definite evidence of an hereditary tendency.

The sternum is often involved in marble-bone disease, but the changes are more diffuse and irregular. Ring-like patterns have been described in the cuboid and cuneiform bones and in the short bones of the extremities, but the author was able to find no other description of the rarefied areas in the sternum with the thick concentric ring pattern observed in his two cases.

Eight roentgenograms. EDGAR SPACKMAN, M.D.
Fort Worth, Texas

Osteosclerosis in Blood Diseases. Osteosclerotic Anemia (Type M. B. Schmidt) and Osteosclerotic Leukemia. Alfred Vogt. Fortschr. a. d. Geb. d. Röntgenstrahlen **71:** 697–717, September 1949. (In German)

Bone studies should be made in all types of leukemia. Four cases of a diffuse osteomyelosclerosis with associated tumor of the spleen and a blood picture such as is found in subleukemic myelosis are reported. Three cases were confirmed by autopsy and biopsy. The differential diagnosis of osteosclerotic leukemia, osteosclerotic bone carcinosis, and osteosclerosis in Paget's disease is discussed.

According to the roentgenogram, three stages of the disease can be distinguished. First, the early fibrosclerotic stage; second, the striated, mottled intermediate stage; third, the diffuse sclerotic terminal stage. The severity of the osteomyelosclerosis depends mainly upon the extent of the myelogenous-metaplastic changes in liver and spleen and not upon the degree of associated anemia.

Twenty-eight roentgenograms.
EUGENE F. LUTTERBECK, M.D.
Chicago, Ill.

Bone Involvement in Cryptococcosis (Torulosis). Vincent P. Collins. Am. J. Roentgenol. **63:** 102–112, January 1950.

A brief description of the mycology and pathology of cryptococcosis is presented. Pertinent points in 17 cases of bone involvement gathered from the literature are cited. The author then presents 3 cases with radiographic and autopsy findings. The lesions in bone are widely disseminated, discrete, and tend to involve bony prominences. They excite no bony reaction and are purely osteolytic. They more closely resemble those reported to occur in blastomycosis and coccidioidomycosis than those of actinomycosis.

Seventeen roentgenograms.
ROBERT A. HAYS, M.D.
Cleveland Clinic Foundation

A Case of Echinococcosis of the Ribs. A. Korossy. Radiol. clin. **19:** 13–17, January 1950. (In German)

A 31-year-old woman stated that she caught a cold in February of 1948 and felt a "stitch" in the left side of the back under the shoulder blade. In March, she noticed a mass between her left shoulder blade and spine, which was not tender to pressure. In April of the same year, x-ray examination showed a pus collection in the thorax on the left side. In May, by means of another x-ray study, an abscess was shown to have formed in the same location. An attack of coughing four weeks later suggested that the swelling might have progressed inward. In July of the same year fluoroscopy was done, with a diagnosis of caries of the ribs. The patient was operated upon and five echinococcus cysts were found involving the eighth and ninth ribs.

The incorrect preoperative diagnosis of cold abscess was made, largely because the author did not think of the possibility of echinococcus. As viewed in retrospect, the roentgen aspects should have been sufficiently characteristic to establish a diagnosis. The picture is one of a cystic type of growth, the affected bone being enlarged, with a web-like structure and a thin cortex. Spontaneous fracture is not infrequent. Periosteal reaction is either absent or not prominent. Often small amorphous calcium shadows are present in the cyst contents. Conditions to be differentiated include: actinomycosis, which forms a solid soft-tissue mass and as a rule does not fluctuate; cold abscesses secondary to caries of the ribs, which would not cause so large a mass and would not give the same cystic appearance of the underlying ribs; other cystic lesions of bone, as chondroma, giant-cell tumor, osteodystrophy, von Recklinghausen's disease, hemangioma, lymphogranuloma, lipogranuloma, myeloma, and metastatic carcinoma.

Diagnosis is strongly suggested, not only by the x-ray appearance, but also by the history and clinical aspects of the case, the fact that the soft-tissue changes directly overlie the bone defect, the presence of eosinophilia, and positive laboratory tests for echinococcus. By considering all of the above aspects a diagnosis should be established in practically every case.

One roentgenogram. EDGAR SPACKMAN, M.D.
Fort Worth, Texas

Carpal and Epiphysial Development. Another Index of Nutritional Status of Rural School Children. O. D. Abbott, Ruth O. Townsend, R. B. French, and C. F. Ahmann. Am. J. Dis. Child. **79:** 69–81, January 1950.

A study of the effect of malnutrition on the date of appearance and the degree of development of ossific centers was made in the pupils of a rural school with an enrollment of approximately 200, located in one of the southern states. The children were grossly malnourished; 90 per cent had gingivitis; 71 per cent anemia; 71 per cent follicular conjunctivitis; 64 per cent cheilosis and angular stomatitis; and 63 per cent skeletal defects. Cardiac defects were observed in 22 per cent, but because of the associated anemia, they were classified as nutritional.

Of the 200 children enrolled, 162, six to thirteen years of age, were selected for the study. The degree of skeletal development, or bone age, was determined by comparing roentgenograms of each child with Todd's standards for carpal development according to sex and age.

The great difference between chronologic and carpal age as observed in many instances indicates that these children had had a major setback in ossification. Wide variations in carpal age were seen in children of the same sex and age. The data show that malnutrition interrupts both the sequence and the time of carpal appearance.

Successive roentgenograms of a greatly retarded boy illustrate the way in which the carpal centers record the

effects of malnutrition and, later, the effects of improved nutrition.

Milk is the best source of calcium and phosphorus; yet it was observed that 74 per cent of this group had almost no milk, while only a few of the remaining 26 per cent had a year-round supply.

Three series of roentgenograms; 3 tables.

MORTIMER R. CAMIEL, M.D.
Brooklyn, N. Y.

Giant-Cell Tumor of the Clavicle. Salomón Kaplán and Juan Carlos Radice. Prensa méd. argent. **37:** 139–141, Jan. 20, 1950. (In Spanish)

This report illustrates the difficulties of diagnosis, operative complications, an unusual localization, and the ever-present problem of the histologic interpretation of giant-cell tumor.

The patient was a boy of eighteen years, suffering from pain of a years duration in the left sternoclavicular region, with radiation to the left arm and the neck. The sudden onset of pain called his attention to a small tumor, hardly palpable. He continued working, but noticed that the process exhibited growth, with periods of pain and relative comfort. On physical examination the patient was in good general condition but showed a slight loss of appetite, which was attributed to twenty injections of an iodine-bismuth preparation. A pronounced tumor was present, but there was no limitation of movement of the arm or of the neck. The roentgenograms showed an osteolytic lesion of the clavicle but without associated enlargement of neighboring or distant nodes. A portion of the clavicle containing the lesion was removed, the middle of the clavicle being divided and the outer end being disarticulated. A fusiform tumor, 9 cm. in diameter, was finally diagnosed as a giant-cell tumor.

Eleven illustrations, including 2 roentgenograms.

JAMES T. CASE, M.D.
Chicago, Ill.

Hereditary Congenital Abnormalities of the Elbows, Knees and Nails in Five Generations. L. S. Wildervanck. Acta radiol. **33:** 41–48, January 1950.

In a family of 53 members, representing 5 generations, 22 were found to have various abnormalities of the elbows, knees, and nails. The abnormalities of the elbows included luxation, subluxation, or malformation of the head of the radius, underdevelopment of the capitellum, and exostoses of the ulna; those of the knees included luxation and absence or hypoplasia of the patellae; those of the nails, absence or dystrophy. In general, the abnormalities did not hamper the persons having them, though involvement of the elbows was associated with limitation of pronation and supination, and luxation of the kneecaps produced a tendency to fall backward.

Others have described a triad of hereditary luxation of the radius, absence or luxation of the patellae, and dystrophy or absence of the nails. Few of these authors, however, have examined the families of their patients extensively.

The author concludes that the hereditary transmission of the complex of anomalies is not sex-linked and is irregularly dominant. He also assumes 3 incompletely linked genes for elbows, knees, and nails.

Sixteen roentgenograms; 3 photographs.

NORMAN GLAZER, M.D.
Cleveland City Hospital

Congenital Absence of the Sacrum and Coccyx. Report of a Case and Review of the Literature. Bernard Freedman. Brit. J. Surg. **37:** 299–303, January 1950.

Forty-four cases of congenital absence of part or all of the sacrum and coccyx have been reported, and to these the author adds another. A tabulation of the findings in the entire series shows that it represents a continuous gradation of degrees of agenesis from absence of merely three of the four coccygeal segments to complete lack of the vertebral column below the tenth thoracic segment.

Functionally the patients may be divided into two groups. In one, the first sacral segment is present, or the fifth lumbar vertebra is sacralized. The bony ring of the pelvis is thus complete, and the weight of the trunk is transmitted through the innominate bones to the femora. Stance and gait are normal, or nearly so. In the other group the sacrum is totally missing, and the iliac bones meet posteriorly, with resultant flattening of the buttocks and decrease in the transverse diameter of the pelvis. In the severer grades, standing and walking are impossible.

With either group there may be associated neurologic abnormalities due to interference with or agenesis of the spinal nerves in the affected segments. Incontinence of urine or of feces, atrophy of muscles, sensory changes, and deformity of the lower limbs may occur. Visceral abnormalities may also be present.

The suggestion is made that in patients who are found to be suffering from abnormalities of the rectum or urogenital tract roentgen examination of the lumbosacral region should be done.

The author's case is reported in detail.

Two roentgenograms; 1 table.

MORTIMER R. CAMIEL, M.D.
Brooklyn, N. Y.

X-Ray Examination of the Exit of the Lowermost Lumbar Root. Ákos Kovács. Radiol. clin. **19:** 6–13, January 1950. (In English)

The various conditions termed lumbosacral osteochondrosis, aside from changes resulting from damage to the spinal cord, are due chiefly to neuralgia from compression of the root of the fifth lumbar nerve. Discovery of its cause is exclusively a roentgenologic problem. Since the usual profile view of the lumbar vertebrae yields an oblique picture of the foramen through which the fifth nerve emerges, processes contracting the nerve cannot be recognized. To show the foramen, the patient should be slightly rotated toward the film until the frontal plane of the patient forms an angle of 60 degrees with the film. The central ray is, tilting cranialward by 25 to 30 degrees, directed to the last lumbar vertebra. By this technic a protrusion contracting the foramen was revealed in 83 of the 165 patients examined for sciatica; the roentgen diagnosis was confirmed at autopsy in 23 instances. In only one of the "positive" cases could the alteration in the foramen have been shown by the usual roentgenographic study.

Three cases are presented.

Five roentgenograms; 3 drawings.

Initial Radiographic Signs in Tuberculosis of the Hip. Giovanni Marcozzi. Ann. radiol. diag. **22:** 3–26, 1950. (In Italian)

The author has studied 25 cases of tuberculous infections of the hip in young children and states that the initial signs are as follows:

(1) Bone atrophy of the articular components (4 cases).

(2) Deformity of the femoral head (22 cases).

(3) Alteration of the articular line (17 cases). These alterations of the articular line were always accompanied by bony changes. In 4 cases they consisted of an enlargement of the articular space and in 13 cases of a diminution of articular space.

(4) Foci of bone destruction (11 cases).

(5) Indistinct contours of the bones (10 cases).

(6) Distention of the capsule and muscular atrophy.

This article is of special interest to American radiologists, inasmuch as tuberculosis of the hip is becoming increasingly rare in this country.

Eleven roentgenograms.

CESARE GIANTURCO, M.D.
Urbana, Ill.

THE SKIN

Idiopathic Calcinosis Universalis Cutis Without Disability. J. H. Peters, R. H. Horn, and L. Greenman. Ann. Int. Med. **32:** 138–145, January 1950.

Cases of cutaneous calcification are morphologically subdivided into two types, calcinosis circumscripta, in which the subcutaneous tissues in the immediate vicinity of joints, particularly of the extremities, are involved, and calcinosis universalis, affecting the deeper subcutaneous tissues and the dermis, usually in the proximal extremities and the pelvic girdle. The authors' case, falling in the latter category, differs from the majority in the remarkable lack of symptoms directly referable to the lesions.

A 57-year-old housewife complained of lumps beneath the skin of her arms and legs of five years duration. Prior to their appearance she had experienced muscle and joint pains in the extremities with associated swelling of the proximal interphalangeal joints of the fingers, but these had gradually regressed.

The patient's skin was dry and soft, with freely movable, hard, non-tender, lobulated nodules in the subcutaneous tissues, varying from 1 to 4 cm. in diameter, principally in the intermuscular grooves of the arms and thighs and over the ischial tuberosities. Moderate generalized lymphadenopathy was present. Laboratory studies showed serum calcium 11.0 and 10.7 mg. per cent, serum phosphorus 3.0 and 3.4 mg. per cent, alkaline phosphatase 4 King-Armstrong units.

Roentgenograms of the extremities revealed multiple areas of calcification in the soft tissues. Some were clearly demarcated, with lobulated contours. Others were more diffuse and spotty. In the gastrocnemius, the deposits were reticulated in an almost vascular pattern. Deposits in the periacetabular areas and over the ischial tuberosities were present. Hands and feet showed early mixed arthritic changes with little or no extraskeletal calcification. Except for these arthritic changes, the bones were everywhere normal. Films of the skull, abdomen, and intestinal tract revealed no abnormalities. A chest plate demonstrated cardiac enlargement and numerous calcified hilar nodes.

A lump removed from the right lateral thigh proved to be a stony calcified nodule. Microscopically it showed degenerative fatty connective tissue with large calcium deposits. On chemical analysis it was found to contain 20.6 per cent of calcium by weight.

Calcinosis universalis is most commonly seen in females. Typically, the overlying skin is involved in the calcific deposits and draining sinuses form when the skin breaks down. Disability due to pain and stiffening of the involved areas is the rule. Fatal terminations are common.

Etiologically four types of skin calcinosis are recognized: (1) those due to certain known disturbances of calcium or phosphorus metabolism, such as vitamin D poisoning, parathyroid disease, chronic fluorosis, and renal failure; (2) calcification occurring at the site of existing infectious or traumatic lesions such as parasitic cysts, old hematomas, sinuses, or abscesses; (3) idiopathic calcification, associated with cutaneous vascular disturbances such as scleroderma or Raynaud's disease; (4) cases in which no accompanying or predisposing condition is detected. The available data place the authors' case in the last group.

Reports of studies of calcium and phosphorus serum levels and balances are conflicting. The frequent association of cutaneous calcification with vascular disorders of the skin suggests that the mechanism of calcification may be associated with circulatory integrity. It has been demonstrated experimentally that damaged tissue may undergo increased calcification when serum calcium levels are artificially increased.

The absence of symptoms in the case reported rendered any attempts at therapy unnecessary.

Four roentgenograms; 1 photomicrograph.

STEPHEN N. TAGER, M.D.
Urbana, Ill.

THE BLOOD VESSELS

(See also under The Chest)

Pelvic Phlebography. R. Baux and J. Poulhes. J. de radiol. et d'électrol. **31:** 7–8, 1950. (In French)

In order to study the pelvic veins a method was devised by which opaque dye is injected into the deep dorsal vein of the penis in men or the clitoris in women. In males a small transverse incision is made near the root of the penis, the deep dorsal vein is isolated and cannulated, and the dye is injected. About 20 c.c. of dye is used, and the first film is taken as the injection is just about complete.

One normal and one pathologic phlebogram are shown.

Two roentgenograms. CHARLES NICE, M.D.
University of Minnesota

GYNECOLOGY AND OBSTETRICS

The Role of Active Exercise in Pelvic Muscle Physiology. Edward Gomer Jones. West. J. Surg. **58:** 1–10, January 1950.

It was demonstrated by Kegel (Am. J. Obst. & Gynec. **56:** 238, 1948) that progressive resistance exercise of the pubococcygeal portion of the levator ani muscles would alleviate urinary incontinence in women in a high percentage of cases. His observations were made with the use of a perineometer, a vaginal resistance chamber with an attached manometer. The author has supplemented these studies by cystography and urethrography, demonstrating that all the pelvic muscles, both smooth and striated, in women can be voluntarily and actively exercised and thus improved in tone and function.

Relaxation and cystocele were demonstrated by a low bladder level or actual herniation. Successful

exercising was demonstrated by a good upward pull of the bladder level.

The application of the principle of exercise will aid in the differentiation of pathologic and dysfunctional conditions. The surgical correction of pathologic conditions will be improved by exercise, while dysfunction, as represented by stress incontinence and various degrees of pelvic relaxation, may be eliminated without recourse to operation.

Fourteen figures, including 7 series of roentgenograms.

MORTIMER R. CAMIEL, M.D.
Brooklyn, N. Y.

A Method of Isometric Pelvimetry with Accurate Outlet Measurements. E. Treptow and A. M. Lilienfeld. Am. J. Obst. & Gynec. **59:** 125–132, January 1950.

The authors contend that the intertuberous diameter is not only inaccurately measured in the usual pelvimetric examination but is also very rarely the diameter involved in obstruction of labor at the outlet. They found, on attempting to deliver a preserved stillborn fetus through a dried pelvis with a contracted outlet, that the head either impinged on the pubic arch and tip of the sacrum in descent or it impinged on the sacral tip as the head was extended after the occiput had passed under the arch. Therefore, they have sought a new method of outlet evaluation.

Anteroposterior, lateral, and pubic-arch films are taken on all patients. The pubic-arch film is made with the patient sitting over the cassette, stooping forward as far as possible, while the tube is centered over the tuberosities at 36 inches target-film distance. Ideal position in this particular view is considered achieved when the patient is able to stoop forward sufficiently to bring the ischiopubic rami parallel to the film. It is necessary to check each examination carefully to determine as closely as possible the amount that each patient has deviated from this ideal position; if the amount of deviation is significant, the films are discarded. The anteroposterior and lateral films are taken according to the technic of Steele and Javert (Am. J. Obst. & Gynec. **43:** 600, 1942. Abst. in Radiology **40:** 108, 1943).

Measurements made on the films are as follows:

1. *Lateral Film:*
   (*a*) The obstetrical conjugate is taken from the upper inner border of the symphysis to the point where the iliopectineal lines meet on the sacrum.
   (*b*) The anteroposterior of the midpelvis is taken from the lower inner border of the symphysis to the junction of the fourth and fifth sacral vertebrae.
   (*c*) The posterior sagittal of the midpelvis is taken from the junction of the fourth and fifth vertebrae to the point midway between the bases of the spines.
2. *Anteroposterior Film* (The distortion scale of Steele and Javert is used for making these measurements):
   (*a*) Greatest transverse diameter of the inlet.
   (*b*) The anterior transverse diameter of the inlet is measured from points nearest the thinnest portion of the acetabula.
   (*c*) The true transverse diameter of the midpelvis is measured from points just anterior to the bases of the spines and evaluated on the distortion scale on the same level as the spines are measured.
3. *Pubic-Arch Film:*
   (*a*) The film is evaluated to see if stooping of the patient was adequate.
   (*b*) A semicircle of 103 mm. diameter (representing a fetal head distorted proportionately as is the pubic arch) is superimposed on the film so that the arc falls anterior and within the confines of the pelvis. The "end-points" of the measurements labeled the "available posterior sagittal" lie posteriorly at the tip of the sacrum and anteriorly where a line drawn from the lower inner border of the symphysis to the sacral tip crosses the arc of the semicircle. This diameter, therefore, varies with the amount of space wasted under the symphysis and with the position of the tip of the sacrum. These are the most important factors in obstruction at the outlet.

At the planes of the inlet and midpelvis the capacities are determined by their respective computed areas.

Morphology is not used for prediction, since a satisfactory quantitative method of classification of pelves has not been devised.

Five illustrations, including 2 roentgenograms.

HARVEY J. THOMPSON, JR., M.D.
Jefferson Medical College

A Consideration of the Midpelvis Among the Factors Which May Influence the Course and Outcome of Labor. Sherwin A. Kaufman. West J. Surg. **58:** 14–19, January 1950.

The course and outcome of 100 obstetrical cases has been correlated with antenatal roentgen studies. Special reference was given to the midpelvic measurements. If the sum of the interspinous and posterior sagittal diameters totaled less than 14 cm., the midpelvis was classified as contracted. Such contraction was present in 30 of the women studied.

Midpelvic contraction in itself appeared to be an aggravating rather than a determining factor in the outcome of labor. The strength of the uterine contractions together with good molding appeared to be the major factor in overcoming this handicap. Parity, the weight of the baby, and its presentation were among the important factors influencing the course of labor.

Other unfavorable architectural features were three times as common in the group with midplane contraction as in the non-contracted group. Where operative interference was required, the incidence of difficult delivery was definitely higher in this group. The total duration of labor appeared to be no greater, but there was a tendency toward a longer second stage. However, the incidence of spontaneous delivery among the 30 patients with midplane contraction was only slightly lower than in the non-contracted group.

It is concluded that, while x-ray studies of the midpelvis are a valuable aid in the management of certain cases, the prediction of the obstetrical course depends upon such complex and variable factors that it cannot be expressed within the limits of a mathematical formula.

Three tables.

MORTIMER R. CAMIEL, M.D.
Brooklyn, N. Y.

X-Ray Incidence of Fractured Clavicle in Vertex Presentation. Robert Farkas and Stuart Levine. Am. J. Obst. & Gynec. **59:** 204–206, January 1950.

Three hundred consecutive living infants born at term in vertex presentation were examined by x-ray for fracture of the clavicle. Five fractured clavicles (1.7 per cent) were discovered, none of which was suspected after the usual delivery-room examination and pediatric examination in the nursery. In each case the location of the break was at the junction of the middle and outer third of the clavicle. With respect to the rotation at the time of the delivery, the posterior side was fractured in 3 cases, the anterior in 1, and the rotation of the fifth case was not recorded.

Four of the mothers were primiparas. All 5 had essentially normal pelves as determined both clinically and by x-ray pelvimetry. All were delivered with elective low forceps and episiotomy.

There were no apparent skeletal abnormalities in these infants. Healing of the fractures occurred spontaneously without treatment and with no residual deformity or limitation of motion.

Two tables.

HARVEY J. THOMPSON, JR., M.D.
Jefferson Medical College

Thoracopagus: Vaginal Delivery Without Destructive Operation. Irving Siegel. Illinois M. J. **97:** 40–42, January 1950.

A case of thoracopagus is presented. The mother was a 22-year-old Negro secundigravida. At twenty-five weeks, the fundus uteri was almost the size of a term pregnancy. A moderate hydramnios made auscultation and palpation difficult. Roentgenograms in the anteroposterior and lateral positions showed two fetuses close together, with heads at the same level, about 2.5 cm. apart, breeches presenting. The proximity of the thoraces was obscured by the maternal spine. It was suspected that the fetuses might be joined, but before the x-ray examination could be repeated, labor started and a thoracopagic monster was delivered from below, without destructive operation.

Two roentgenograms; 2 photographs.

THE GENITO-URINARY SYSTEM

Biochemical Studies of Urokon (Sodium, 2,4,6-Triiodo-3-Acetylaminobenzoate), a New Pyelographic Medium. Dorothy R. Neuhaus, Adam A. Christman, and Howard B Lewis. J. Lab. & Clin. Med. **35:** 43–49, January 1950.

This paper reports experiments with a new pyelographic contrast medium, sodium 2,4,6-triiodo-3-acetylaminobenzoate (Urokon), which in clinical usefulness compares favorably with other compounds. Studies of its acute and chronic toxicity in the rat, dog, and monkey indicated that four to eight times the amount, per kilogram of body weight necessary to visualize the kidneys in man produced no toxic symptoms. Likewise, no microscopic changes of the kidneys were observed in rats given daily injections of 0.2 gm. of Urokon per kilogram of body weight for two weeks.

A colorimetric method for the determination of Urokon in urine, blood, and various animal tissues has been devised by the authors. The medium was excreted rapidly after intravenous injection into rats, rabbits, and man, with a concurrent decrease of the amount in the blood. In the rabbits and man, the rates of excretion were comparable with those of diodrast and neoiopax. It would appear that Urokon, like diodrast, is excreted to a large extent by a tubular mechanism.

The Renal Fascia. G. A. G. Mitchell. Brit. J. Surg. **37:** 257–266, January 1950.

The author investigated the anatomy of the renal fascia by injecting a fine barium emulsion into the perinephric space under fluoroscopic observation, with roentgenograms for a permanent record. The findings were checked by subsequent section of the specimens. The important findings, based on 64 radiological studies, include the following:

1. The renal fascia is formed by a splitting of the retroperitoneal tissue to form a loose, common investment for the kidney and suprarenal.
2. The anterior and posterior layers of this fascia are fused superiorly and laterally; also medially and inferiorly.
3. Above the suprarenal the fusion is firm, but beneath the kidney it is weak. The weakest spot through which perinephric effusions may escape most easily is in the vicinity of the ureter.
4. The two perinephric spaces are neither in actual nor potential communication.
5. Fluids escaping from the perinephric space spread downward in the retroperitoneal tissue and may invade the pelvis, but until the pressure is raised, the spread is strictly unilateral.
6. Extension to the opposite side occurs most often in the lumbosacral region.
7. When rupture occurs in the hilar region, usually the anterior layer of fascia and the attached peritoneum both give way, and this permits invasion of the peritoneal cavity.
8. The experiments suggest that effusions spreading from the renal region which become arrested about the iliac crest are probably paranephric rather than perinephric in origin.

Nineteen illustrations (14 roentgenograms).

MORTIMER R. CAMIEL, M.D.
Brooklyn, N. Y.

A Brief Outline of the Pathology of Tumours of the Kidney. R. A. Willis. J. Faculty Radiologists **1:** 145–146, January 1950.

The author classifies tumors of the kidney as follows: (1) cortical adenoma; (2) cortical carcinoma (Grawitz's tumor or hypernephroma); (3) papilloma and carcinoma of the pelvis; (4) embryonic tumors of childhood, called also nephroblastomas, Wilms' tumors, adenosarcomas, mixed tumors, etc.; (5) non-epithelial tumors; (6) metastatic tumors.

It is pointed out that while many renal carcinomas attain a large size and produce an obvious mass or obvious pyelographic abnormalities, small growths restricted to the cortex may metastasize without causing any recognizable radiographic changes.

GLENN F. MILLER, M.D.
The Henry Ford Hospital

Renal Tumours in Childhood. T. Twistington Higgins. J. Faculty Radiologists **1:** 157–164, January 1950.

Benign tumors of the kidney are rare in childhood. The outstanding malignant tumor is the embryoma, or Wilms' tumor. This can usually, though not invari-

ably, be diagnosed from the clinical and radiologic picture. Pyelography will furnish information as to the presence of a second, sound kidney. It also helps in differential diagnosis. In Wilms' embryoma it is usual to see, somewhere in the field, a fragment of pelvis filled with the dye, although there are many variations and even total obliteration. In the sympathoblastoma the pelvis is more or less normal but grossly displaced, while in hydronephrosis the kidney will almost certainly be silent.

Treatment of Wilms' tumor is "profoundly disappointing." The author recommends nephrectomy plus postoperative x-ray therapy if the tumor is relatively small when first seen. Preoperative x-ray therapy should be given if the tumor is large.

Twenty illustrations. GLENN F. MILLER, M.D.
The Henry Ford Hospital

Tumours of the Kidney. Alan Stewart Johnstone. J. Faculty Radiologists **1:** 147–156, January 1950.

The author divides the criteria laid down as a basis for diagnosis of a renal tumor into two groups—those which are evident on the plain film and those which are found by pyelography.

On the plain film are to be found (1) deformity of the renal outline; (2) enlargement of the renal outline; (3) displacement of the renal outline; (4) calcification. The essential features of each of these four points are discussed and it is concluded that there appears to be some support both for Mintz's observations (J. Urol. **39:** 244, 1938) that renal tumors do not displace the renal pelvis downward and medially together and for Greene's hypothesis (J. Urol. **59:** 174, 1948. Abst. in Radiology **52:** 146, 1949) that a tumor which displaces a normal functioning kidney over the midline is probably simple and extrarenal in origin. Calcification is of diagnostic value but is rarely present.

The principal pyelographic features are: (1) obliteration, partial or complete, of the calyces; (2) elongation of the calyces, with either compression or dilatation; (3) displacement of the calyces; (4) secondary dilatation of the calyces; (5) obliteration, partial or complete, of the renal pelvis; (6) dilatation of the pelvis; (7) displacement of the pelvis and upper third of the ureter; (8) non-filling of calyces and pelvis.

Tumors of the renal pelvis are much less common than those of the parenchyma. Carcinoma will produce irregular filling defects in the pyelogram. Hemangioma is almost impossible to diagnose radiologically, but a pyelogram showing a peculiar network in a small cavity, produced by the medium percolating into the interstices of the angiomatous mass, is said to be pathognomonic. Finally, tumors of the pelvis may produce complete obstruction so that pyelography by either method is impossible.

Brief mention is made of renal teratomas, renal cysts associated with hypertension, and arteriography as a possible diagnostic procedure.

Thirteen roentgenograms.

GLENN F. MILLER, M.D.
The Henry Ford Hospital

Tumours of the Kidney. R. Ogier Ward. J. Faculty Radiologists **1:** 165–171, January 1950.

The more common malignant tumors of the kidney met with in adults are carcinoma or hypernephroma and papilloma of the renal pelvis. Squamous-cell epithelioma of the renal pelvis, often associated with calculus, and sarcoma are of rare occurrence.

Hematuria, pain, and a palpable tumor in the loin are the leading clinical manifestations of hypernephroma. The radiologist may find tumors of the lower pole more easy to recognize that those of the upper, but in either case, if the patient is well prepared and the technic good, there is no doubt that even a simple radiograph will frequently demonstrate a hypernephroma with far more precision than is possible by palpation. If, after a plain film and an excretion urogram, doubt still remains, there should be no hesitation in proceeding to an ascending pyelogram, which may often usefully be combined with a ureterogram. Even when the diagnosis is not in doubt, the ascending pyelogram, by its greater display of detail, may forewarn the surgeon of difficulties to be encountered at operation.

Five roentgenograms; 2 photographs.

GLENN F. MILLER, M.D.
The Henry Ford Hospital

Ureterocele in Infancy and Childhood. Robert E. Gross and H. William Clatworthy, Jr. Pediatrics **5:** 68–77, January 1950.

The authors review the 21 cases of ureterocele treated at the Children's Hospital, Boston, during the past twenty years. The average age of the patients at the onset of the presenting illness was twenty-two months; 9 were less than one year of age. Fifteen of the children were girls. In 13 cases the ureterocele was on the left side and in 7 on the right. One patient had bilateral abnormalities. In 12 of the 21 cases there were double ureters on one or both sides.

By careful roentgen investigation, the correct diagnosis was made in 10 of the 21 cases without cystoscopy. The intravenous pyelogram was diagnostic in 6 instances; suitable films showed hydroureter and hydronephrosis in association with an ipsilateral translucent filling defect in the dye-filled bladder shadow. In a few cases, the ballooned-out and dye-filled ureterocele is more opaque than the bladder shadow, and certainly the intense and continued opacification of a ureter, particularly when this is dilated, should make one suspect obstruction at its lower end. A cystogram should be made on any patient whose pyelogram suggests low ureteral or ureterovesical obstruction. By moderately distending a bladder with 4 per cent sodium iodide solution, a filling defect such as that made by a distended ureterocele can often be demonstrated.

While cystoscopy is not required in all cases, generally it is desirable to confirm the diagnosis which has already been made by roentgenographic means or to establish the diagnosis when other types of examination have failed to indicate satisfactorily the nature of the lesion.

A ureterocele should never be excised. It can be made to collapse by merely incising its dome in a longitudinal manner for a distance of 2 to 4 mm. This effectively relieves the ureteral obstruction and is the most important step in the treatment of any existing urinary infection. Chemotherapy is a valuable adjunct in the treatment of pyuria but will have permanent benefit only if the mechanical obstruction has been completely eradicated.

Five roentgenograms; 13 drawings; 1 chart; 1 table.

RADIOTHERAPY

Differentiation and Irradiation. S. Ry Andersen. Acta radiol. **33:** 57–68, January 1950.

The author uses the term differentiation to designate transformation of a tumor from a more "unripe" to a more "ripe" specialized state. He investigated a number of characteristic tumor types in which, theoretically, it should be possible histologically to demonstrate differentiation before, during, and after irradiation. Other authors are quoted as having maintained that increased differentiation takes place as a result of irradiation.

This material included (1) squamous-cell carcinomas, (2) adenocarcinomas, and (3) sarcomas in man and transplanted tumors of the same types in mice. For the animal tumors the irradiation factors were 193 kv., 20 ma., 0.5 mm. Cu filter, half-value layer 0.85 mm. Cu, focal-skin distance 50 cm. The dosage differed somewhat, but most often was 400 r twice daily, up to 5,000–6,000 r. In addition, a number of treatments were carried out in one sitting, with a dose ranging from 25 to 2,000 r. The human tumors were submitted to the usual radiation technics at the Radium Center in Copenhagen.

The histologic material comprised 986 microscopic preparations from a total of 660 tumors. Among the entire material, the author did not find in any instance signs of increased, regular orderly differentiation in the irradiated tumors as would be expected if irradiation produced increased differentiation. The differentiation remained unchanged in all essentials after irradiation.

On the basis of these observations it is concluded that the dosage in clinical radiotherapy should not be adapted to alterations, if any, in the differentiation during or after the irradiation, as has been advocated by other authors. The histologic reaction in a malignant tumor during radiation is not a fit standard by which the radiation dose can be adapted. This can be done more safely on the basis of clinical observation of the patient and tumor during irradiation. The author has no doubt that the histologically demonstrable changes in the irradiated tumors are signs of degeneration, interpretable as being of non-specific nature, as the individual elements are frequently found in a milder degree in the untreated tumors.

Six photomicrographs. HARRY HAUSER, M.D.
Cleveland City Hospital

Cancer of the Lip. Bernard Pierre Widmann. Am. J. Roentgenol. **63:** 13–24, January 1950.

The author reviews the 363 cases of cancer of the lip seen at the Philadelphia General Hospital during the past twenty years, for the special purpose of evaluating the results of various technical procedures of irradiation. When a group of 104 hopeless cases is eliminated, the curability rate is 83 per cent.

The palliative effect of irradiation in late advanced cases was disappointing. Lesions involving the buccal commissure and buccal mucosa metastasized frequently and early. Syphilis was not considered an important etiologic factor. Pipe smoking was a possible predominant etiologic factor in many instances. Although many discrepancies were present, in general, the longer the duration of the disease before treatment the less likely the possibility of a good result. Results according to the grade of tumor did not reveal any significant differences except to show evidence of more resistance to irradiation in the highly differentiated lesion.

Radionecrosis or so-called post-irradiation ulcers occurred in 12 cases, but in each instance excellent healing and a good cosmetic result were achieved. Bone necrosis occurred in 23, or 6 per cent of 363 cases. In 9 cases, (3.5 per cent) bone infection developed; in 7 this occurred following dental extraction six months to two years after completion of successful treatment.

Roentgen rays and radium produced equally good results. Interstitial radon—gold-filtered seeds—was also effective. Radium needles used interstitially were tried but this method was discarded in favor of surface applicators. Electrodesiccation was satisfactory for small or questionable lesions, but the cosmetic results, especially with the larger lesions, were not as good as with radiation. Surgery was employed for only a few resistant or recurrent cases or in instances of late radionecrosis when possible residual disease was suspected. None of the author's series was treated with low-voltage contact therapy.

Although the radium technic varied considerably during the twenty years, most of the lesions received a similar total amount of radiation, varying from 2 to 8 threshold erythema doses according to the size and degree of marginal infiltration. The average, according to the Paterson-Parker chart, was found to be 6 threshold erythema doses (6,000 gamma roentgens), but frequently this figure was extended to as much as 8 to 10. In about half of the cases filtration equivalent to 2 mm. of platinum was used, but the results were not superior to those in cases where 0.5 mm. of platinum equivalent was used. The radium capsules were spaced 1 cm. apart in layers of rubber. The capsules were 24 mm. in length and were used in a cross-fire method to irradiate a field extending at least 1 to 1.5 cm. beyond the visible or palpable margins of the lesion. All radium applications were given in divided doses. A minimum of 6 threshold erythema doses was always predetermined for shallow lesions, but at least 8 to 10 for large ulcerations. A maximum daily dose of 200 to 300 mc. hours was given to lesions needing a total of 2,000 mc.-hours.

Contact radium applications have the disadvantage of frequent exposure of the operator to the radium, since the average case needed 6 to 8 applications.

Low-voltage roentgen irradiation produced uniformly satisfactory results with doses ranging from 3,000 to 4,500 r (measured in air), delivered at voltages ranging from 80 to 145 kv. with inherent tube head filtration of 0.5 mm. of aluminum. Intensity and rate of treatment were 1,000 and 1,500 r three times a week for the shallow and thick lesions respectively. If the treated area is greater than 2 cm. in diameter, then the fractionation dosage should be reduced to 500 r three times a week and the total dose increased to 3,500 r for shallow lesions and 5,000 r for those thicker than 0.5 cm.

High-voltage roentgen radiation, 200 kv. and filtration of 0.25 and 0.5 mm. of copper is preferred for lesions larger than 1.5 cm. in diameter. These received a dose of 5,000 r (measured in air) in fractions of 300 r to portals 5 × 6 and 6 × 8 cm. and 500 r to portals approximately 4 × 5 cm. The treated area must include tissue well beyond the clinically deter-

mined margins of the lesion. Two-thirds of the dose is given first to this larger field and the last one-third is given to a field 1 to 1.5 cm. beyond the palpable area of involvement. The excellent healing, good cosmetic results, and high number of cures in 41 advanced cases treated by high-voltage radiation made it preferable to radium for this type of lesion.

More treatment may be necessary for residual tumor, and this must be individualized to the patient by the experience of the radiologist. Enlarged nodes must be considered metastatic until proved otherwise, and can be treated with 200 kv. with 0.5 mm. of copper. The author localized the treatment to the involved area. The total dose was 5,000 and sometime 6,000 to 7,000 r in multiples of 500 daily or every other day. The skin reaction is marked, and subsidence occurs in about six to eight weeks. If nodes are present at this time, surgery is indicated, especially in Grade I and II lesions. In the group of 259 cases not previously treated, 23 or 9 per cent had palpable nodes on admission; in 13 per cent nodes appeared after completion of treatment and apparent clinical cure of the primary lesion.

Although 46 of the cases were treated with prophylactic irradiation to cervical node regions, this has now been discontinued by the author since there was no evidence of any benefit.

Seventeen photographs; 2 charts.

WYLIE H. MULLEN, JR., M.D.
Cleveland Clinic Foundation

Cancer of the Lip. C. C. Burkell. Canad. M. A. J. **62:** 28–33, January 1950.

This paper is a review of 534 consecutive cases of cancer of the lip treated radiologically. This type of cancer comprised 11.3 per cent of the total of all cases of malignant disease seen in the Saskatoon Clinic (Saskatoon, Sask., Canada), where the material for this paper was gathered. The mean age of the patients was fifty-seven years, with the greatest number in the age group between fifty and fifty-nine years. Only 1.4 per cent were females. Most of the lesions occurred on the lower lip, and all except 5 were epidermoid carcinoma, the exceptions proving histologically to be, respectively, one intra-epidermal carcinoma (Bowen's disease), one carcinoma "*in situ*," one basosquamous carcinoma, and two basal-cell carcinomas.

The lesions were graded according to the method employed at the Holt Radium Institute in England. This is briefly as follows:

Stage I: Less than 3 cm. in diameter.
Stage II: Over 3 cm. in diameter. No palpable nodes.
Stage III: Significantly palpable nodes.
Stage IV: Far advanced disease.

By far the greatest number of cases in this series fell into the Stage I group (90.1 per cent). In only 3.4 per cent was there metastasis to the regional nodes when the patient was first seen.

Most of the patients were treated with either roentgen irradiation or radium implants. Surgical excision alone was used in only 9 cases. Radon seeds, alone and combined with x-ray therapy, electrodesiccation, surgery, radium bomb, and radium implants were used in 70 cases.

In 5.2 per cent of the patients a recurrence developed anywhere from six months to ten years following treatment of the original lesion. Some of these were probably new lesions. The over-all five year survival rate was 89.5 per cent. The rate for Stage II cases (36) was 69 per cent and for Stage III cases (15) 33 per cent. Of the 3 patients with Stage IV lesions, none survived five years.

HARVEY J. THOMPSON, JR., M.D.
Jefferson Medical College

Diagnosis and Treatment of Laryngeal Tumors. Daniel S. Cunning. J. A. M. A. **142:** 73–76, Jan. 14, 1950.

Simple indirect visualization of the larynx with a mirror will reveal most laryngeal tumors in an early stage. In spite of this many patients are still referred for treatment with far advanced tumors because of failure to examine the larynx on account of a noticeable change in voice or persistent hoarseness.

Polyps, papillomas, hyperkeratotic papillomas, vocal nodules, and cysts are benign lesions treated by removal and vocal rest. Contact ulcers must also have strict vocal rest.

Cancer of the larynx may be treated by surgery, radiation, or both. For early cancer involving one cord either method may be used, radiation therapy leaving a more normal voice. Extension to other parts of the larynx is an indication for total laryngectomy. If nodes are involved, neck dissection is done, followed by x-ray therapy.

One table.

ZAC F. ENDRESS, M.D.
Pontiac, Mich.

Anterior Glottic Cancers. Radiographic and Radiotherapeutic Considerations. F. Baclesse and R. Henry. J. de. radiol. et d'électrol. **31:** 1–7, 1950. (In French)

About 10 per cent of carcinomas of the larynx are found on the anterior glottis. Tumors in this location are more frequent in males than in females (about 6:1). Lateral or profile views are preferred to tomography in most cases for demonstration of these lesions. The invasive tumors frequently involve the thyroid cartilage. The limited type may appear as a polypoid excrescence of tumor tissue. In infiltrative carcinomas the prognosis should be more reserved because of their more malignant tendency and later diagnosis.

Radiographic studies are important, and, if the findings are suspicious, careful evaluation should follow. One case with biopsy revealing no malignant change was treated as syphilis and later proved malignant.

Between 1938 and 1946, 15 patients were treated by radiotherapy alone. Eight of 9 limited, and 1 of 4 invasive cases showed a survival of three to seven years. About 6,000 to 8,000 tissue roentgens are given, with diminishing field size down to 2 × 2 cm.

Nine roentgenograms; 2 drawings.

CHARLES NICE, M.D.
University of Minnesota

Cancer of the Breast. A Clinical Study of 1,042 Cases Treated at Radiumhemmet, 1936–1941. Bengt A. Nohrman. Acta radiol., Suppl. LXXVII, 1949.

This 86-page pamphlet is an interesting study of the cases of breast cancer treated at the Radiumhemmet during the period 1936–1941. Its special virtues include an adequate summary and conclusion.

The author opposes the more stringent criteria of operability and believes it "more correct in principle to offer the largest number of patients the possibility of

definite health offered by surgical intervention." With regard to age and prognosis, proof is lacking that those under age thirty-five have a poorer outlook, but the author admits to such an impression. Stage I cases with medial quadrant lesions definitely have a poorer prognosis than those with outer quadrant lesions.

The radiotherapists at the Radiumhemmet favor preoperative irradiation, arguing that in the most unfavorable cases significant improvement is obtained. Since the clinical examination cannot be relied upon for accurate classification of the individual case, all cases are subjected to preoperative irradiation; the technic is described. In addition, postoperative irradiation is advocated. Repetition of the series at two months and again after three more months has been routine, but the author concedes the possible advantage of a single series with higher doses, concentrating on the parasternal and supraclavicular nodes: the latter point is important, in the mind of the abstracter. Castration is not favored as a routine procedure at the Radiumhemmet.

The results of treatment at the Radiumhemmet are given, and many other interesting points are made in the discussion.

JAMES A. READ, M.D.
The Henry Ford Hospital

Results of Roentgen Therapy in Skeletal Metastases of Cancer of the Breast. Francesco Santagati. Radiol. clin. **19:** 51–57, January 1950. (In French)

A review of the cases presenting skeletal metastases of carcinoma of the breast seen at the Institute of Radiology of Milan from 1928 to 1947 is presented. Attention was given to the age of patients, histologic grade of tumors, and the interval between discovery of the primary growth and the occurrence of bone metastases. While roentgen therapy tends to promote healing of osteolytic lesions, especially in younger subjects, the average total survival was best in those patients in whom a relatively longer time (up to four years) elapsed between discovery of the primary growth and the occurrence of bone metastases.

CHARLES NICE, M.D.
University of Minnesota

Results of the Treatment of Hypernephroma. Margaret Snelling. J. Faculty Radiologists **1:** 172–175, January 1950.

Eighty cases of hypernephroma were seen over a period of twenty-four years at the Myerstein Institute of Radiotherapy (Middlesex Hospital). Of this group, 54 were seen prior to 1944, and upon these the author bases her study of results. Twenty-nine were treated by nephrectomy alone, and of these 15 survived five years and 8 ten years. Eight patients received postoperative roentgen therapy. In 7 of this number the growth had been found at operation to extend beyond the kidney and removal was thought to be incomplete. Six of these patients died within three years; 2 were still alive, 1 more than ten years. Three patients with inoperable tumors were given radiotherapy, but all died in less than three years. In 14 cases the disease was too far advanced for treatment of any type; there were no three-year survivals in this group.

It is concluded that in hypernephroma the prognosis must be related to the stage of the growth when the patient is first seen.

Seven tables.

GLENN F. MILLER, M.D.
The Henry Ford Hospital

Wilms' Tumour. R. A. Russell Taylor. Brit. J. Surg. **37:** 283–287, January 1950.

The author reports a case of Wilms' tumor in a 5-year-old boy. Nephrectomy was followed by deep roentgen therapy, a total of 2,250 r being given in equal doses to the anterior, posterior, and lateral abdominal areas over a period of sixteen days. The patient is alive and well six and a half years later.

An interesting and concise summary of the clinical aspects of Wilms' tumor is given. There is no disagreement as to the necessity for postoperative roentgen therapy. The question of preoperative irradiation is still a matter of debate. Some workers feel that reduction of the size of the tumor and the production of fibrosis, which diminishes vascularity, are definite advantages. Others are fearful of the delay. Still others believe that the sole aim of preoperative therapy should be to reduce the tumor to operable dimensions.

Three illustrations.

MORTIMER R. CAMIEL, M.D.
Brooklyn, N. Y.

Wilms' Tumor. Frederick B. Mandeville. Urol. & Cutan. Rev. **54:** 49–53, January 1950.

Preoperative x-ray therapy is not often given to a Wilms' tumor, since exact diagnosis is difficult without laparotomy, though aspiration biopsy is sometimes successful in skillful hands. Postoperative x-ray therapy is recommended by the author when excision is not considered complete—to a tumor dose not exceeding 3,500 r. He does not favor irradiation in a growing child if nephrectomy has been successful and no involvement of the lymph nodes or other structures is found with adequate pathologic study at the time of operation.

Although some authors claim that x-ray findings are diagnostic in Wilms' tumor, neuroblastoma is often confused with it and occurs just as frequently. Pyelography reveals distortion or displacement of the calyces, pelvis, and possibly of the upper ureter.

The author has treated 10 cases of Wilms' tumor. Only one of his patients is living. In this case aspiration biopsy was followed by preoperative roentgen therapy and nephrectomy. The survival period has now reached ten years. This case was previously reported in Urol. & Cutan. Rev. **49:** 204, 1945 (Abst. in Radiology **46:** 314, 1946).

ZAC F. ENDRESS, M.D.
Pontiac, Mich.

Clinical Radiation Dosage. II. Inter-Relation of Time, Area and Therapeutic Ratio. III. A Biological Factor in Radon and Isotope Dosage. Lionel Cohen. Brit. J. Radiol. **22:** 706–713, December 1949; **23:** 25–27, January 1950.

In the second of his series of papers on Clinical Radiation Dosage (for the first, see Brit. J. Radiol. **22:** 160, 1949. Abst. in Radiology **54:** 310, 1950), the author has analyzed published data on skin reaction and lethal dose levels for epidermoid cancer and derived mathematical factors suitable for clinical application. Nomograms based on these factors are given, by means of which the optimum tumor dose for a given set of circumstances can be computed. In addition, the most favorable scheme of fractionation, the therapeutic ratio, and the maximum permissible heterogeneity can be determined for a tumor of any specified dimensions.

The third paper concerns a biological factor in dosage. In specifying the dose of radiation the over-all time is of

equal importance with the actual amount of radiation. If E is the dose of radiation giving a certain clinical effect when delivered in a single dose, the fractionated dose, D, required for the same effect may be determined by the formula: $D = ET^n$ (T is time; n is the recovery exponent, which is 0.33 for human skin and 0.22 for epidermoid carcinoma).

For irradiation with x-rays, or gamma rays, T may be readily and accurately determined, but for radon in permanent implants and for isotopes the dosage rate is continuously diminishing, so that the concept of overall time in its simplest form is untenable. A chart is worked out for radon, showing that when 8,000 gamma r are given in thirty days, the skin tolerance is exceeded during the second week, but 5,800 gamma r in eleven days does not exceed the tolerance dose and delivers an acceptable dose to a tumor.

Calculations are also presented for application of radioactive isotopes, showing the critical interval to be 2.75 times the half-life of the isotope used. A formula and nomogram are given relating skin tolerance and the lethal dose for epidermoid carcinoma with isotopes of various half-lives. The figures indicate that isotopes of moderately long half-lives may have a clinical advantage. SYDNEY J. HAWLEY, M.D.
Seattle, Wash.

An Improved Dose Calculator for Linear Radioactive Sources. L. A. W. Kemp. Acta radiol. **33:** 17–30, January 1950.

The construction of a direct-reading dose calculator for screened linear radium sources is described, and the theory upon which it is based is set forth. The instrument represents an improvement upon a simpler one previously presented (Brit. J. Radiol. **17:** 300, 1944; **18:** 5, 1945). It simulates a radioactive source, the strengths and lengths of whose components may be varied at will. The source may consist of up to three screened components in tandem, not necessarily of the same linear activities. The actual dosage is read directly in roentgens per hour on a specially calibrated microammeter. The calculations can be made rapidly even for complicated radium implants, and no mathematical skill is required.

Fourteen figures; 1 table. SHOZO IBA, M.D.
Cleveland City Hospital

Remote-Controlled Radium Emanation Plant and Automatic Measuring Apparatus for Gold Implants. John E. Rose and Robert W. Swain. J. Nat. Cancer Inst. **10:** 605–623, December 1949.

This article describes the radium emanation plant and measuring apparatus for gold implants which has been in use since 1941 in the U. S. Marine Hospital, Baltimore, Md. The plant is a variation of the original Failla design. It is equipped for semi-automatic operation and is unique in that remote control of the stopcocks has been incorporated into the installation.

The automatic measuring device for gold implants measures and records the activity of each implant and deposits it in a compartment corresponding to its range of activity.

Diagrams and photographs of the apparatus are included. DONALD S. CHILDS, JR., M.D.
The Mayo Clinic

RADIOISOTOPES

Use of Radioactive Colloidal Metallic Gold in the Treatment of Malignancies. P. F. Hahn and E. L. Carothers. Nucleonics **6:** 54–62, January 1950.

This is a clinical paper appearing in a technical journal and could easily be overlooked by those who are anxious to keep a complete file on this particular method of treatment. It deals with the use of Au^{198}, which has been found to meet the criteria for therapeutic usefulness (see Hahn and Sheppard: Ann. Int. Med. **28:** 598, 1948. Abst. in Radiology **52:** 306, 1949) and has been employed over a period of three years in treatment of lymphoid-macrophage disease. Since gold is not moved about the body as are a number of other materials, which are dissolved following phagocytosis, several attempts have been made at direct infiltration of tumor tissue with the isotope. This method is described in an earlier paper (Hahn *et al.*: J. Lab. & Clin. Med. **32:** 1442, 1947. Abst. in Radiology **51:** 609, 1948). It has the great advantage that the radiosensitivity of the skin does not have to be taken into consideration, so that large doses of radiation can be delivered to the subcutaneous and other tissues. Preliminary studies have shown good results in fibrosarcoma and squamous-cell carcinoma. The best results with intravenous administration of radioactive gold have been obtained in chronic lymphogenous or myelogenous leukemia, the lymphomas, and lymphosarcoma.

Three photographs. S. F. THOMAS, M.D.
Palo Alto, Calif.

Treatment of a Lingual Thyroid with Radioactive Iodine. J. A. Schilling, J. W. Karr, and J. B. Hursh. Surgery **27:** 130–138, January 1950.

A case of lingual thyroid in a 38-year-old white woman with symptoms of fifteen years duration is reported. This is the first known case to be treated with radioactive iodine. After an oral test dose of 1.4 millicuries of I^{131}, a therapeutic dose of 10 millicuries was given. There was marked concentration of isotope in the tumor at the base of the tongue. At two months after treatment, the basal metabolic rate was minus 14. Signs of hypothyroidism developed, which were relieved by thyroid extract. The tumor diminished in size. Biopsy two years later showed thyroid tissue with atrophy and fibrosis. It was estimated that the dose in the lingual thyroid was 11,000 roentgens equivalent physical.

Ten illustrations. J. E. WHITELEATHER, M.D.
J. E. GARDNER, M.D.
Memphis, Tenn.

Use of Isotopes as Metabolic Tracers. DeWitt Stetten, Jr. Ann. Int. Med. **32:** 1–5, January 1950.

The tracer technic involves the labeling of a molecule in such a fashion that it or its derivatives are recognizable to the experimenter. Clearly what is required is a labeled molecule which so simulates its naturally occurring analog as to deceive the experimental animal and to be readily detected and quantitatively estimated by the experimenter. These requirements are almost

deally met by the isotopes of the elements of organic chemistry, carbon, hydrogen, nitrogen, oxygen, sulfur, phosphorus, iodine, etc.

In the simplest type of experiment, in which the question is whether a particular dietary or body constituent is converted in the body into some other product, one has merely to synthesize the suspected precursor in such a fashion as to include one or more isotopic atoms, administer it to the animal, and, after a period of time, isolate the suspected product from the tissues or excreta. The presence of the isotope in the product is *prima facie* evidence that the suspected transformation has taken place. Examples of such proved reactions are the conversion of palmitic into stearic acid and *vice versa;* the conversion of serine into cystine, ethanolamine, and glycine; the conversion of proline into ornithine, glutamic acid, and hydroxyproline; the conversion of cholesterol into cholic acid and pregnandiol.

The rate at which some body constituent is being simultaneously synthesized and degraded while the quantity of constituent remains sensibly constant has attracted attention and has given rise to the concept of "turnover." Thus, it was early shown that in the animal at constant weight and uniform nutrition, even though the quantity of depot fat remained constant, each day a portion of this depot fat was mobilized and degraded while an equivalent amount of newly synthesized depot fat made its appearance. By the application of tracer technics it has been shown that the half-life of the depot fatty acids is five to six days in the mouse, and about nine days in the rat.

The rates of turnover of several other body constituents have similarly been calculated from observations of the rate of change of isotope concentration in these substances under suitable conditions, while the animal was kept at constant body weight and on a uniform diet. The relatively sluggish turnover of liver glycogen, under these circumstances, contrasts with the rapid rate at which glycogen reappears in the liver when, following its elimination by fasting, a glycogen precursor is fed.

These and other examples of the application of tracer technics indicate their value in research in intermediary metabolism. STEPHEN N. TAGER, M.D.
Urbana, Ill.

Determination of the Blood Volume in the Heart and Lungs and the Cardiac Output through the Injection of Radiophosphorus. Gustav Nylin and Hjördis Celander. Circulation **1:** 76–83, January 1950.

Red blood corpuscles from a sample of venous blood, labeled with P^{32}, were reinjected into an arm vein, and measurements of the concentration of the isotope were taken on arterial samples withdrawn at intervals thereafter from the opposite arm.

Dilution curves were drawn from the values obtained and formulae derived for both cardiac output and the blood volume of the heart and lungs. The results indicate that from 29 to 35 per cent of the total blood volume is contained in the heart and lungs.

Four roentgenograms; 4 graphs; 1 diagram; 4 tables. ZAC F. ENDRESS, M.D.
Pontiac, Mich.

EFFECTS OF RADIATION

The Shoe-Fitting Fluoroscope as a Radiation Hazard. Leon Lewis and Paul E. Caplan. California Med. **72:** 26–30, January 1950.

The fluoroscopic shoe-fitting machine has been used in this country for approximately twenty-five years. During that time hundreds of thousands of adults and children have had their feet exposed at intervals to x-ray beams. Yet, because of the latent period between cause and effect in low-dosage radiation, it is impossible at present to determine merely by clinical examination whether or not deleterious influences have been produced by this device. It is also difficult to estimate the probability of harmful effect.

Tests of direct beam intensity and stray radiation from shoe-fitting fluoroscopes indicate wide variability of exposure of patrons and salesmen, with some exposures far in excess of standards for safe use of the apparatus.

The principal potential danger is interference with bone growth in children as a result of careless use of uncontrolled dosage of x-ray. Although less likely, there is also some possibility of excessive exposure of shoe salesmen in exceptional circumstances.

The growing probability of increasing use of ionizing radiations warrants vigorous governmental control or possibly elimination of procedures of questionable merit which involve public risk.

Three charts; 4 tables. DANIEL WILNER, M.D.
Atlantic City, N. J.

The Reciprocal Vicinity Effect of Irradiated Tissues on a "Diffusible Substance" in Irradiated Tissues. Benjamin Jolles. Brit. J. Radiol. **23:** 18–24, January 1950.

Simultaneous roentgen exposures of small fields separated by varying distances were made on human subjects. Control areas of the same size, but single, were made at a symmetrical site. The factors generally used were 180 kv., 10 ma., 0.5 to 1.0 mm. Cu filtration, h.v.l. 0.85 to 1.0 mm. Cu, 30 cm. focal skin distance, with 39 r per minute. In a few instances 140 kv. were used, with h.v.l. 0.33 mm. Cu. In the majority of instances 800 r measured on the skin were administered.

The amount of scattering received for the adjacent area in the paired areas varied from 3 to 6 per cent depending upon the distance.

When the separation of the paired areas exceeds a certain minimum value, the erythema in each square is equal to that of the single control area. When the separation is less than the critical distance, the reaction becomes greater as the separation becomes less. For areas 1.56 × 1.56 cm. the critical distance of separation is 2 cm. For areas 3.5 × 3.5 cm. the critical distance is 4 cm. By stepping the dose down, the degree of difference may be determined. This in some instances amounts to 25 per cent, which is too high to be accounted for by back-scatter.

The theory is advanced that the irradiation produces a diffusible substance which enhances the reaction in nearby areas. SYDNEY J. HAWLEY, M.D.
Seattle, Wash.

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